

POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

HELICOPTER TUG—
page 110

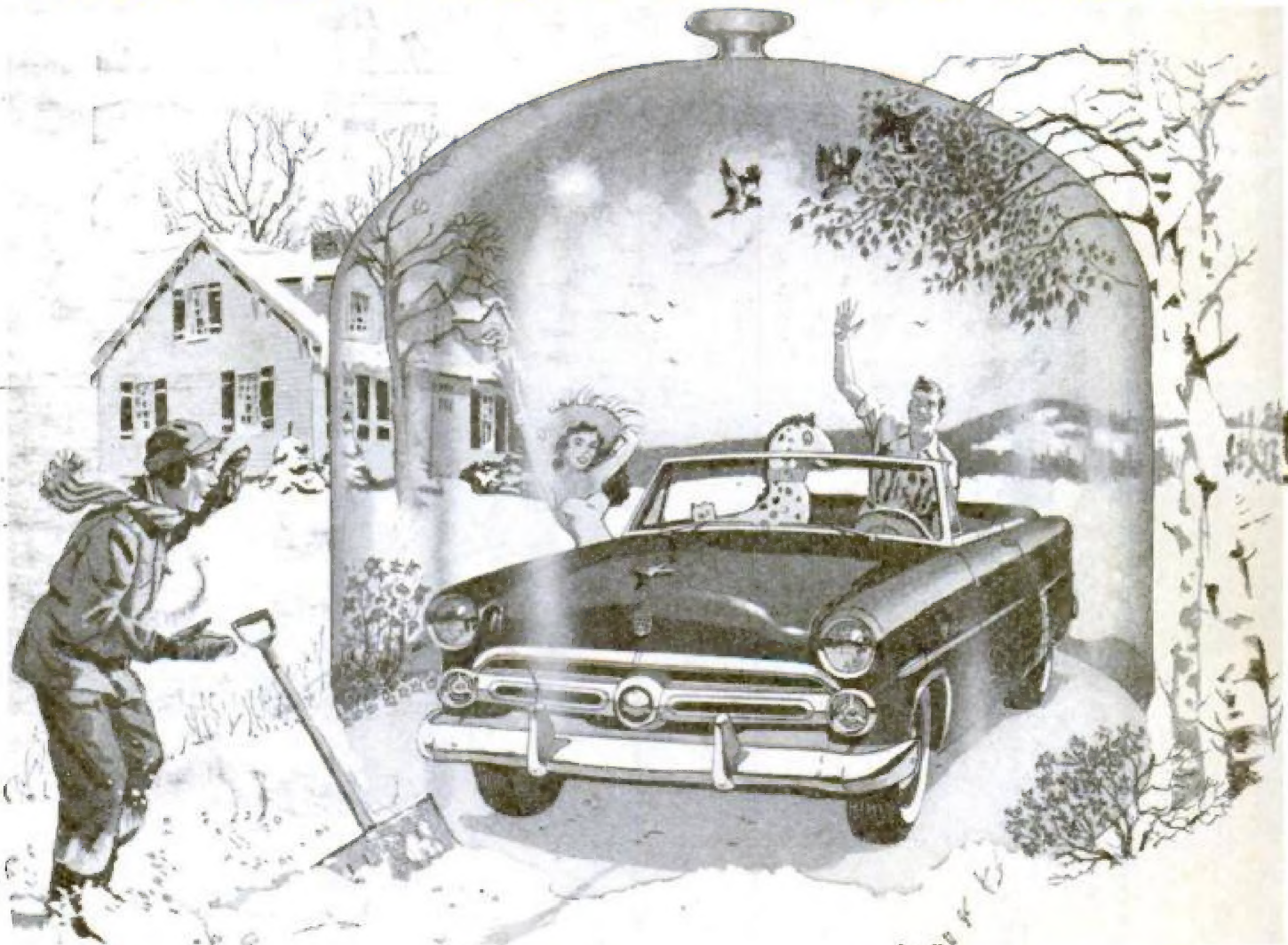


In This Issue
FORTUNES FROM IDEAS

What the Owners Say
About the **NASH**

For the Craftsman
Christmas Toys You Can Make

Your Ford won't feel the winter



...if you use parts that are made right for Fords



Available at all Ford Dealers and the selected independent garages where you see this Genuine Ford Parts sign.

When you get your Ford ready for winter . . . if replacements will add to its zip . . . insist on Genuine Ford Parts like the three at the left. Here's why they make a big difference:

Ford Batteries are tested to go at 20 below . . . shake-tested, impact-tested for durability and cycled from charge to discharge hundreds of times for long life. Testing batteries *before* approval for manufacture is assurance that your Ford is always ready to go!

Ford Oil Filter Cartridges are Track Tested for thousands of miles. Both full-flow and by-pass filters remove contaminants dependably, efficiently *without* removing useful oil additives!

Ford Spark Plugs are made to exact Ford specifications. They're balanced to your Ford's ignition system to give smooth engine performance and high gasoline mileage!

KEEP YOUR FORD ALL FORD



**Never
needs
waxing!**

So I Says: **"O.K., MABEL—YOU DO IT!"**

I'm putting down a new floor of Goodyear VINYL-TILE in my kid's room when my wife, Mabel, says: "That looks easy!"

Well now I'd always prided myself on being sort of handy around the house—so this makes me burn. After all, I'd never tried to tell her how to cook.

So I calls her bluff and says: "O.K., Mabel—you do it!"

And bless Pat if she didn't! Together, we finished the room quick as a wink.

But I found out later that she still thinks I'm pretty smart. You see, it's the only flooring she's ever had that *never needs waxing* (that's because it's specially pre-polished at the factory to a natural, lifetime luster).

It's so easy to keep clean and sparkling—saves her so much time—that she's giving me all the credit when she shows off our new VINYL-TILE floor to her friends!

P. S. That's right! Goodyear VINYL-TILE is so easy to install, you can do a professional looking job in your own home—and it comes in 18 beautiful colors, by the tile or roll. SEND FOR THE FREE VINYL-TILE "SELF INSTALLATION" BOOKLET—address a postcard to: Goodyear, Flooring Dept. K-8318, Akron 16, Ohio.



FLOR-MASTER INSTALLATION KIT

provides the simple tools required to do a professional job in jig time. Available at all better dealers'—where Goodyear VINYL-TILE is sure to be a featured item.

GOOD YEAR Vinyl-Tile

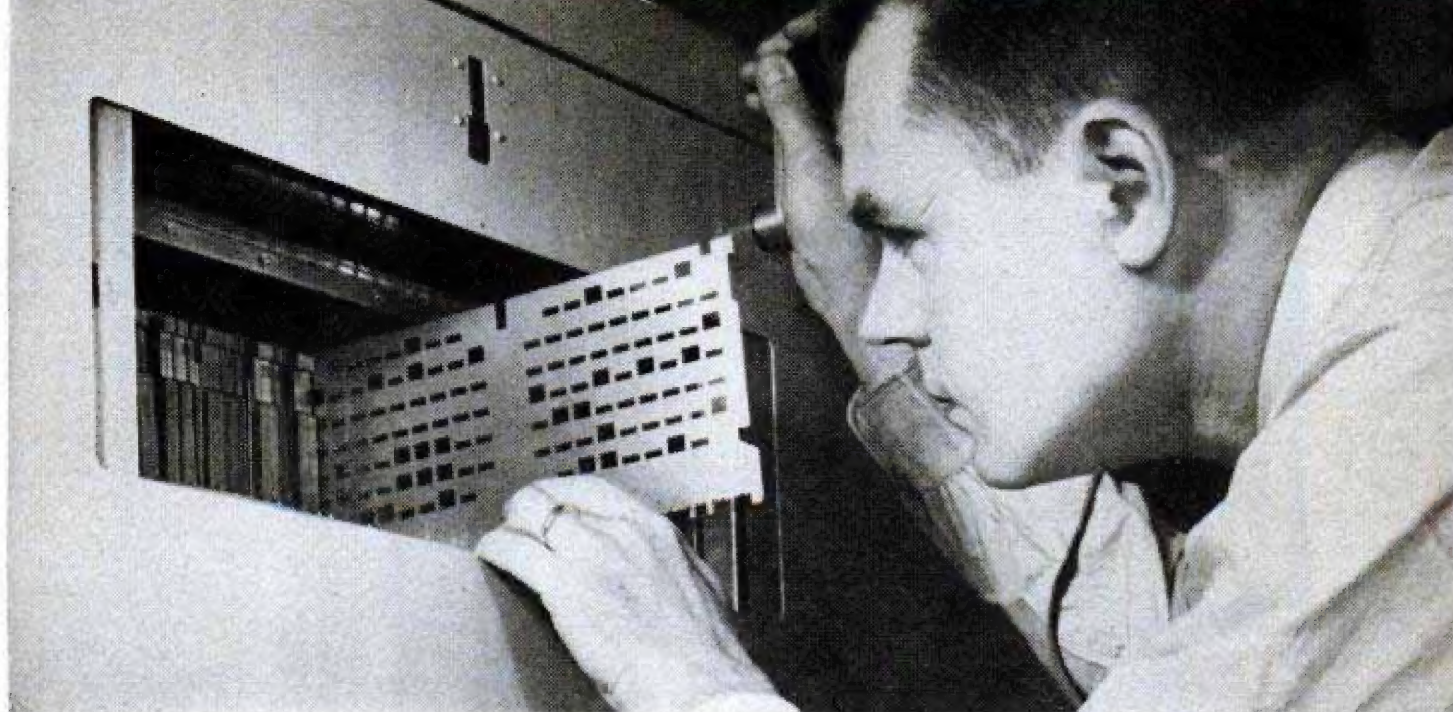
By the Tile • By the Roll • FOR FLOORS • WALLS • COUNTER TOPS

Flor-Master—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

This One

NOVEMBER 1953





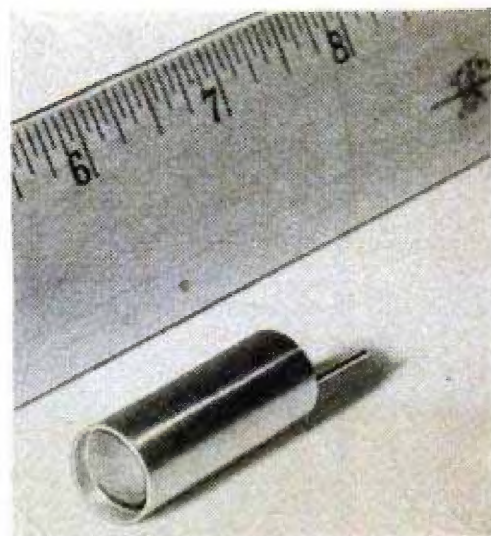
Checking perforated metal card in Bell's new "card file." If the first voice-way is in use, a "detour" is swiftly found.

CARDS FOR CONVERSATION

To find out how to route Long Distance calls a dial system needs lots of information — fast. To provide it Bell Laboratories engineers developed a new kind of card file—one that dial systems can read.

Punched holes on metal cards tell how calls should be handled. When a call arrives the appropriate instruction card is displaced so that its pattern of holes is projected by light beams on a bank of Phototransistors, which signal switches to set up the best connection.

The "card file" will have its widest use in speeding Long Distance calls that are now dialed by a telephone operator and may one day be dialed by you personally. It is another example of how Bell Telephone Laboratories helps telephony to grow, as costs are kept down.



New Phototransistor unit. Light entering cylinder is focused by lens on germanium that responds by generating current. Like the Transistor, the Phototransistor was invented in Bell Telephone Laboratories.



BELL TELEPHONE LABORATORIES

IMPROVING TELEPHONE SERVICE FOR AMERICA PROVIDES
CAREERS FOR CREATIVE MEN IN SCIENTIFIC AND TECHNICAL FIELDS

Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, Founder

H. H. WINDSOR, JR., Editor and Publisher



this month's cover

REMEMBER the old days—and not so many days ago, either—when a helicopter seemed downright ridiculous and everybody laughed at the weird craft as it shuddered laboriously into the air? The whirlybirds have come a long way since then, as a good many soldiers wounded in Korea will gladly attest. Now who can predict the future of these versatile windmills that outperform the birds themselves in flight? One of the leading helicopter experts, Dr. J. A. J. Bennett of Hiller Helicopters, now suggests it's entirely possible that powerful eggbeaters of the future may serve as tugs for big airliners. Airports could be moved to downtown locations, where a copter tug would lift a transport vertically, then detach itself when the big liner attained flying speed. Similarly the tug could fasten itself to an incoming plane and lower it to the ground. Turn to page 110 for details of this authoritative proposal

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Other items, and manufacturers of available products described, are listed on pages 14, 16 and 18



Don't put in a drop of anti-freeze...

UNTIL YOU'VE CLEANED OUT RUST WITH

DU PONT *Cooling System* **CLEANSER**



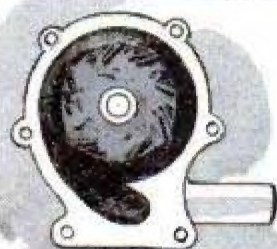
**HOW RUST AND ACID CORROSION WASTE
ANTI-FREEZE ... CAUSE TROUBLE AND EXPENSE**



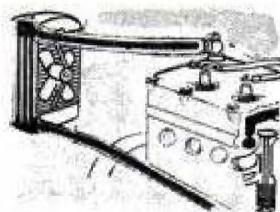
Accumulated rust, scale and corrosion plug radiator passages. This slows down circulation, may cause leaks. Anti-freeze may leak out ... or "boil out" as motor overheats.



Acid corrosion and rust take place in engine block, too. Circulation slows down, proper cooling becomes impossible. Motor overheats and causes "boiling out" or creeping of anti-freeze.



Water-pump impeller blade is often attacked and eaten away by rust and corrosion. This causes failure of circulation in cooling system and dangerous overheating.



The heater is also part of your car's cooling system. Rust, scale and acid corrosion can impair its operation by clogging passages or destroying vital parts such as tubes.



REG. U.S. PAT. OFF.

**BETTER THINGS FOR BETTER LIVING
... THROUGH CHEMISTRY**

Before you put in anti-freeze, your car's cooling system needs a careful check-up.

Clean out rust and scale—safely, easily, thoroughly—with Du Pont Cooling System Cleanser.

Simply pour Du Pont cleanser in the radiator and run the motor. It works even while you're driving ... dissolves rust so it can be drained out. No reverse flushing necessary. Neutralizer is included in each can to complete the job. Insist on the original and genuine Du Pont Cleanser, marketed only by Du Pont in a package bearing the red Du Pont oval trade mark.

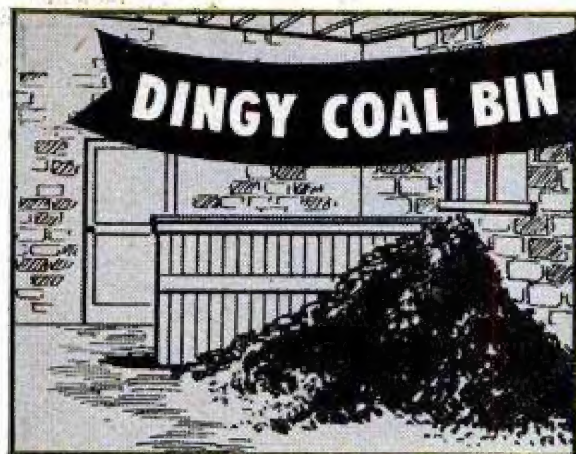
Ask about the complete Du Pont pre-anti-freeze service at your service station today and assure trouble-free driving this winter. Or get a can of Du Pont Cooling System Cleanser at your auto supply store ... \$1.25 at most dealers.

Insure against leaks that waste anti-freeze with DU PONT Cooling System SEALER

Even though your cooling system seems watertight, many permanent anti-freezes will "creep" through tiny pinholes. You can stop this seepage immediately with Du Pont Cooling System Sealer. Simply pour it into your radiator. It can't clog or harm hose or metal parts.



Don't forget fuel line anti-freeze—Du Pont Gas Guard.



becomes **BRIGHT GAMEROOM**



TORIDHEET has direct heating action

Flames actually contact the wall of the combustion chamber, concentrating intense heat directly on the surfaces which heat the water or air. This direct action insures speedy heating with top fuel efficiency.

WITH **TORIDHEET** AUTOMATIC HEATING

The instant you install modern, trouble-free TORIDHEET gas or oil heating in your home, your coal bin becomes a "has been". And you add enough extra space to build that children's playroom, family recreation room, or workshop you've always dreamed of.

Economical TORIDHEET pays for itself, slashing fuel bills up to 50%. No more ashes, clinkers or coal to haul ... just clean, even, healthful heat at the flick of a finger.

Don't spend this winter babying a fuel-hogging furnace. Install convenient TORIDHEET and relax in comfortable, work-free warmth.

Complete Furnaces or Conversion Burners—oil or gas

ENJOY FUEL SAVINGS OF UP TO 50% — MAIL THIS COUPON TODAY!

**TORIDHEET DIVISION
CLEVELAND STEEL PRODUCTS CORP.
7312 Madison Avenue, Cleveland 2, Ohio**

Please rush me complete facts on the TORIDHEET Wall Flame Burner with direct heating action.

Name

Address

City Zone State



Gasoline Age...New Era for **FIRE PUMPING**



With the invention of the "gas buggy," dreams of a truly practical self-propelled fire engine became a reality. By 1910 several manufacturers were producing gasoline-propelled fire engines that far outclassed the horse-drawn pumps still in common use. Shown here is one type of gasoline-propelled pumper used nearly half a century ago.

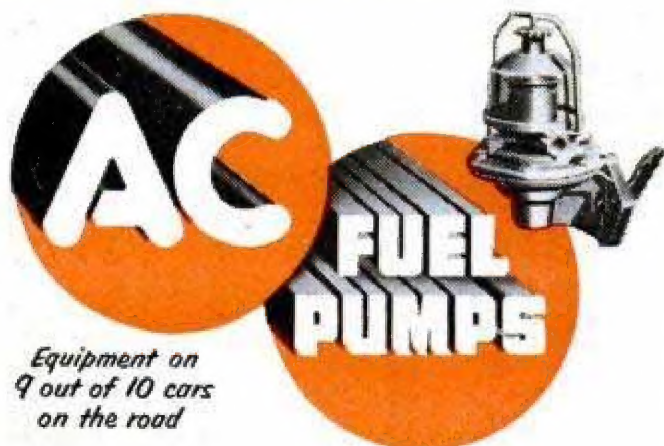
AC FUEL PUMPS

... America's First and Finest

Just as the gasoline engine brought a new era to fire fighting, AC Fuel Pumps brought a new era to automobile performance—supplying exactly the right amount of gasoline to the car's carburetor under all operating conditions.

That's why more than 115,000,000 AC pumps have been built—and more than 40,000,000 are now in daily use.

That's also why so many motorists—in order to maintain efficient performance and trouble-free service—replace their mileage-weary fuel pumps with new ACs—first choice of both car makers and car owners for 26 years.



AC SPARK PLUG DIVISION



GENERAL MOTORS CORPORATION

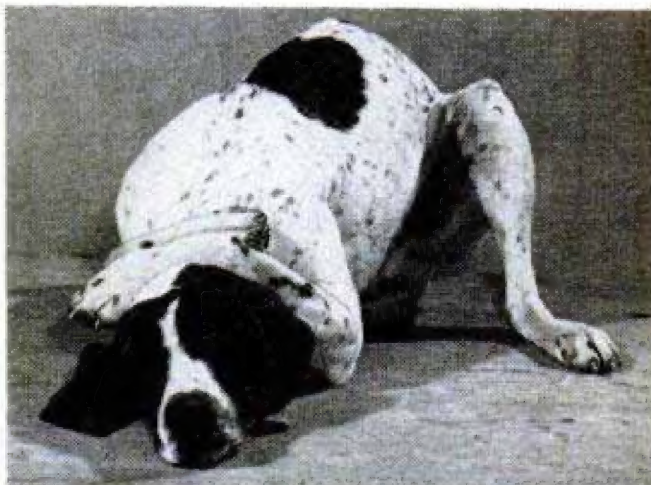
in this corner..... **THE EDITORS**



No Dumb Clucks Here!

Herewith we present two friends of Associate Editor Cliff Hicks. They live on a small farm near Hot Springs, Ark., the remarkable laboratory of psychologists Keller and Marian Breland.

The dog—"Putty" by name—can be molded into any out-of-this-world position and will remain motionless without a flick



of an eyelid until he is given a releasing command.

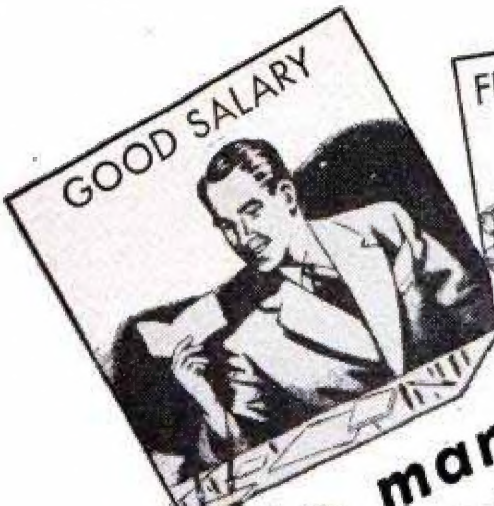
And the chicken? Keller Breland caught the bird in an untrained flock and gave it to our startled editor. "Train it to do anything you want," he said. Using Breland's training methods, Hicks taught the chicken within a half hour to leaf through a copy




of *Popular Mechanics*, a page at a time. Now he swears he could have taught it to read the table of contents if he'd had another day or two with the Brelands! Keller, on the other hand, wasn't much impressed.

Starting on page 81, you'll meet a whole zoo of remarkable animals trained by the two Brelands. It's the first section of a two-part story. Of interest to pet owners is the fact that the psychologists make no secret of their simple training methods and say

(Continued to page 8)




GOOD SALARY




FINE CAR

To the man who wants to enjoy an ACCOUNTANT'S CAREER



A NICE HOME



BANK ACCOUNT

FREE SAMPLE LESSON

IF you're that man, here's something that will interest you.

Not a magic formula—not a get-rich-quick scheme—but something more substantial, more practical.

Of course, you need something more than just the desire to be an accountant. You've got to pay the price—be willing to study earnestly, thoroughly.

Still, wouldn't it be worth your while to sacrifice some of your leisure in favor of interesting home study—over a comparatively brief period? Always provided that the rewards were good—a salary of \$4,000 to \$10,000?

An accountant's duties are interesting, varied and of real worth to his employers. He has *standing*!

Do you feel that such things aren't for you? Well, don't be too sure. Very possibly they *can* be!

Why not, like so many before you, investigate LaSalle's modern Problem Method of training for an accountancy position?

Just suppose you were permitted to work in a large accounting house under the personal supervision of an expert accountant. Suppose, with his aid, you studied accounting principles and solved problems day by day—easy ones at first—then more difficult ones. If you could do this—and could turn to him for advice as the problems became complex—soon you'd master them all.

That's the training you follow in principle under the LaSalle Problem Method.

You cover accountancy from the basic Principles right up through Accountancy Systems and Income Tax Procedure. Then you add C. P. A. Training and prepare for the C. P. A. examinations.

As you go along, you absorb the principles of Auditing, Cost Accounting, Business Law, Statistical Control, Organization, Management and Finance.

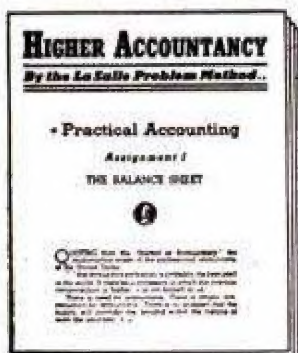
Your progress is as speedy as you care to make it—depending on your own eagerness to learn and the time you spend in study.

Will recognition come? The only answer, as you know, is that success *does* come to the man who is really *trained*. It's possible your employers will notice your improvement in a very few weeks or months. Indeed, many LaSalle graduates have paid for their training—with increased earnings—before they have completed it! For accountants, who are trained in organization and management, are the executives of the future.

Get Free Sample Lesson—Also "Accountancy, The Profession That Pays"

For your own good get all the facts. Write for Free Sample Lesson—also 48-page book "Accountancy, The Profession That Pays." They will prove that Accountancy offers brilliant futures to those who aren't afraid of serious home study, and will show the wide range of opportunities that exist today. No cost or obligation. If you want a position of higher income, greater prestige and professional standing... **MAIL THE COUPON NOW!**

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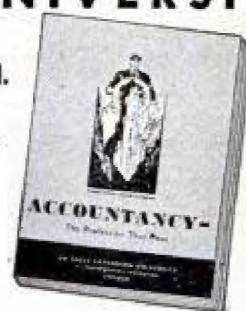
417 S. Dearborn St. Dept. 1164 H Chicago 5, Ill.

I want to be an accountant. Send me without obligation, Free Sample Lesson—also "Accountancy, The Profession that Pays."

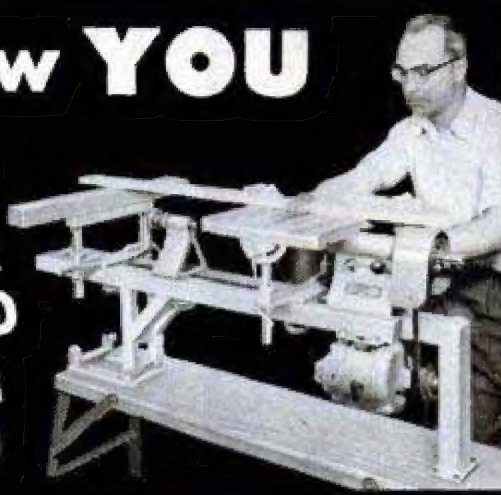
Name.....Age.....

Address.....

City, Zone & State.....



How YOU
can
**SAW
DRILL
GRIND
TURN
SAND**



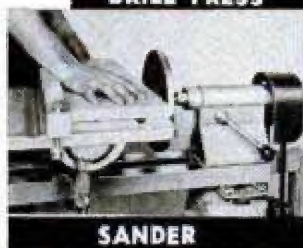
with SUPERSHOP

5 BIG POWER TOOLS IN 1

When you DO-IT-YOUR-SELF with SUPERSHOP you save money and you have fun. You can build a house or a garage — handle BIG jobs. The 8 inch saw cuts 2½ inches deep. Heavy tubular steel frame. 100% Ball Bearing. Lifetime accuracy. Save \$65.05—buy direct from factory. Take advantage of our FREE trial plan. You can buy on EASY TERMS. Write for FREE How-To-DO-It Catalog.



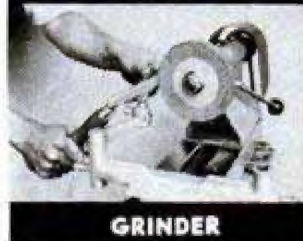
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Write for **FREE** How-To-Do-It Catalog.

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YOUR COPY
SEND POSTCARD

FACTORY
TO YOU

\$79⁹⁵

EASY PAY PLAN

POWER TOOLS INC. 153A Yates Ave.
Beloit, Wis.

(Continued from page 6)

anyone can train a cat, dog, pig, chicken or even a bull to do spectacular tricks.

Two or three days after training his chicken, Hicks walked into the Brelands' home for his last lunch with the two psychologists. On the table was a delicious meal of cold chicken and deviled eggs. At that point our editor suddenly realized he had to run to catch his plane, and somehow he didn't find time to eat a bite that day.

Don't miss the Christmas gift section coming in the December issue—gifts for the man of the house, for the home and the woman who runs it, and for the youngsters.

To the Editor:

Since you ran the article on my benthoscope dive to 4500 feet off Santa Cruz Basin in August 1949, I have visited another



Ready to go aloft in tree-climbing cage in jungle

new world. I enclose photos of a tree climber which I tried out in primeval tropical forests of Gabon and Oubangui-Chari, French Equatorial Africa. This represents civilized man's first attempt to explore the tropical treetop world. Here live colobus monkeys, guenon monkeys, mandrills, snakes, pangolins, pottos, galagos, hyraxes, etc. Only Pygmies have explored this world.

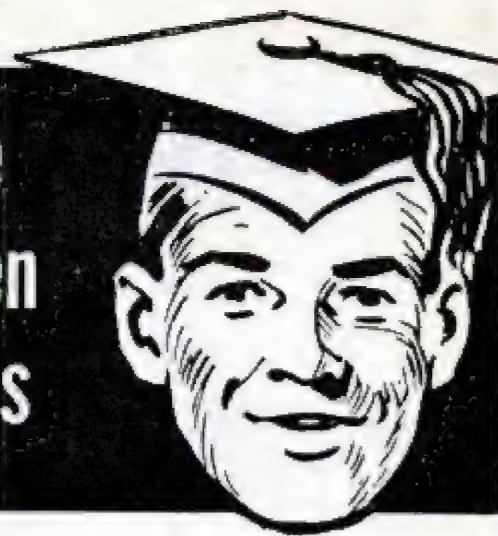
Otis Barton.

EDITOR'S NOTE: Our account of Doctor Barton's deep-sea adventure in the benthoscope was published in PM, October 1949. He is now in Africa again. The treetop

(Continued to page 10)



How to compete with college men for the best jobs



You can break through the education barrier that bars you from top-salary jobs. You can climb as fast and as far as any college man. Whether your field of interest is engineering, business management or industrial supervision, you can hurdle your education handicaps. How? Listen...

AVOID THIS COMMON ERROR Why do men spend four years at college? To get a good job when they get out. And many of them stop right there. They get their good job and relax. A college education is a fine thing. But it's not a free ticket to automatic prosperity.

The non-college man with average intelligence and above-average ambition can beat the free-rider every time. All it takes is a little concentrated training.

TRAINING WHEN IT COUNTS You learn best when you can apply what you learn *on the spot*. I. C. S. training is closely related to your job. You master a problem one day and put it into practice the next.

No lectures to attend. No notes to take. Your professor is your specially edited text. Your laboratory is your shop or office.

What's more, by learning on-the-job, you are bound to move up. Your study is reflected in your work. Your employer gets regular reports of your progress. You demonstrate your willingness and ability to make good. No free-rider, you. You earn every promotion and you're a better man for it.

FREE EXPERT GUIDANCE In this competitive world, you need help. No other training institution has had more experience guiding men and women to success than the International Correspondence Schools. None offers a wider selection of success-proved courses.

Mark and mail the coupon below. You will get the famous 36-page guidebook, "How to Succeed," plus the 1953-54 catalog on the subject that interests you. Here's free expert guidance! Here's the way to start cracking the education barrier!

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<input type="checkbox"/> Auto-Elec. Technician
<input type="checkbox"/> Auto Body Rebuilding and Refinishing
<input type="checkbox"/> Diesel—Gas Engines
AVIATION
<input type="checkbox"/> Aeronautical Engineering Jr.
<input type="checkbox"/> Aircraft Engine Mechanic
<input type="checkbox"/> Airplane Drafting
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<input type="checkbox"/> Architecture
<input type="checkbox"/> Arch. Drafting
<input type="checkbox"/> Building Contractor
<input type="checkbox"/> Estimating
<input type="checkbox"/> Carpenter and Mill Work
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<input type="checkbox"/> Reading Blueprints
<input type="checkbox"/> House Planning
<input type="checkbox"/> Plumbing | <input type="checkbox"/> Heating
<input type="checkbox"/> Steam Fitting
<input type="checkbox"/> Air Conditioning
<input type="checkbox"/> Electrician
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<input type="checkbox"/> Business Administration
<input type="checkbox"/> Certified Public Accountant
<input type="checkbox"/> Accounting
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<input type="checkbox"/> Stenography and Typing
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<input type="checkbox"/> Federal Tax
<input type="checkbox"/> Business Correspondence
<input type="checkbox"/> Personnel and Labor Relations
<input type="checkbox"/> Advertising
<input type="checkbox"/> Retail Business Management
<input type="checkbox"/> Managing Small Business
<input type="checkbox"/> Sales Management
<input type="checkbox"/> Salesmanship
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<input type="checkbox"/> Civil Engineering
<input type="checkbox"/> Structural Engineering
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<input type="checkbox"/> Highway Engineering
<input type="checkbox"/> Reading Blueprints
<input type="checkbox"/> Concrete Construction
<input type="checkbox"/> Sanitary Engineering
DRAFTING
<input type="checkbox"/> Aircraft Drafting
<input type="checkbox"/> Architectural Drafting
<input type="checkbox"/> Electrical Drafting
<input type="checkbox"/> Mechanical Drafting
<input type="checkbox"/> Structural Drafting
<input type="checkbox"/> Sheet Metal Drafting
<input type="checkbox"/> Mine Surveying and Drafting
ELECTRICAL
<input type="checkbox"/> Electrical Engineering
<input type="checkbox"/> Electrician
<input type="checkbox"/> Electrical Maintenance
<input type="checkbox"/> Electrical Drafting
<input type="checkbox"/> Electric Power and Light
<input type="checkbox"/> Lineman
HIGH SCHOOL
<input type="checkbox"/> High School Subjects | <input type="checkbox"/> College Preparatory
<input type="checkbox"/> Mathematics
<input type="checkbox"/> Commercial
<input type="checkbox"/> Good English
MECHANICAL AND SHOP
<input type="checkbox"/> Mechanical Engineering
<input type="checkbox"/> Industrial Engineering
<input type="checkbox"/> Industrial Supervision
<input type="checkbox"/> Foremanship
<input type="checkbox"/> Mechanical Drafting
<input type="checkbox"/> Machine Design-Drafting
<input type="checkbox"/> Machine Shop Practice
<input type="checkbox"/> Tool Design
<input type="checkbox"/> Industrial Instrumentation
<input type="checkbox"/> Machine Shop Inspection
<input type="checkbox"/> Reading Blueprints
<input type="checkbox"/> Toolmaking
<input type="checkbox"/> Gas—Electric Welding
<input type="checkbox"/> Heat Treatment—Metallurgy
<input type="checkbox"/> Sheet Metal Work
<input type="checkbox"/> Sheet Metal Pattern Drafting
<input type="checkbox"/> Refrigeration
POWER
<input type="checkbox"/> Combustion Engineering
<input type="checkbox"/> Diesel—Electric
<input type="checkbox"/> Electric Light and Power | <input type="checkbox"/> Stationary Steam Engineering
<input type="checkbox"/> Stationary Fireman
RADIO, TELEVISION, COMMUNICATIONS
<input type="checkbox"/> General Radio
<input type="checkbox"/> Radio Operation
<input type="checkbox"/> Radio Servicing—FM
<input type="checkbox"/> Television
<input type="checkbox"/> Electronics
<input type="checkbox"/> Telephone Work
RAILROAD
<input type="checkbox"/> Locomotive Engineer
<input type="checkbox"/> Diesel Locomotive
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(Continued from page 8)



Cage slides on cable with Pygmies for passengers

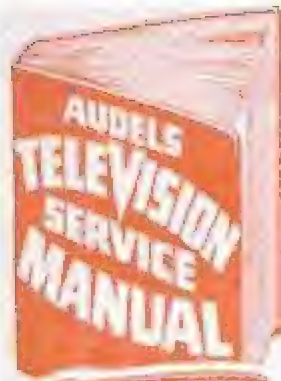


Closeup of treetop inhabitant was made from cage

world he is exploring starts, he says, about 100 feet above the forest floor and some trees are 300 feet high. Barton's tree climber is a cage of aluminum and wood equipped with two winches attached to the floor, each with a hand-lever ratchet. Each reel contains several hundred feet of 1/4-inch steel cable. The cage climbs to 150 feet above the ground in 20 minutes; landing safely on a high limb is a ticklish venture, Barton writes, and it is necessary to put a line over the limb above.

Sorry, Our Mistake

A photograph on page 69 of our September issue bore a misleading caption indicating customs officers were hunting contraband in bales of wool. Actually their purpose was to sample wool shipments for tests to determine the required duty.



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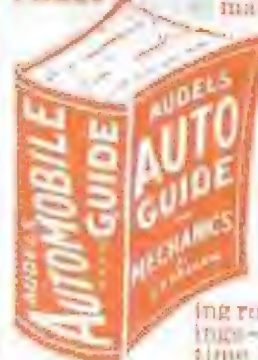
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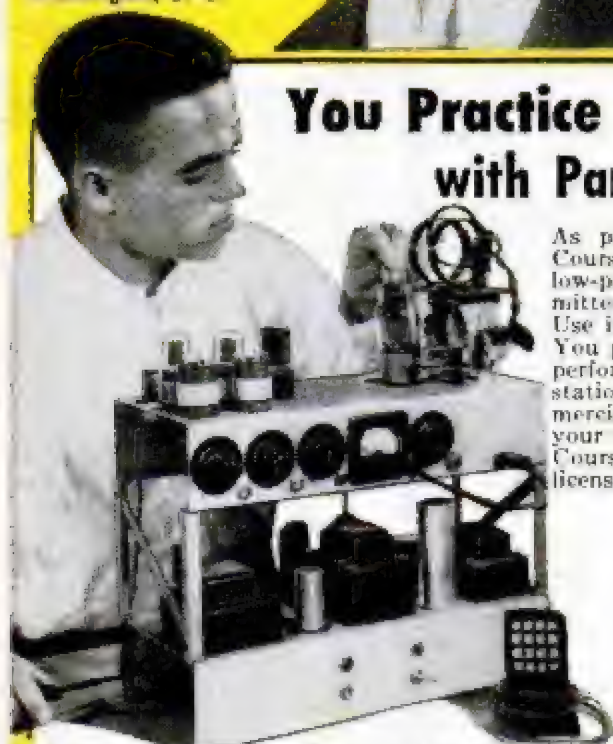
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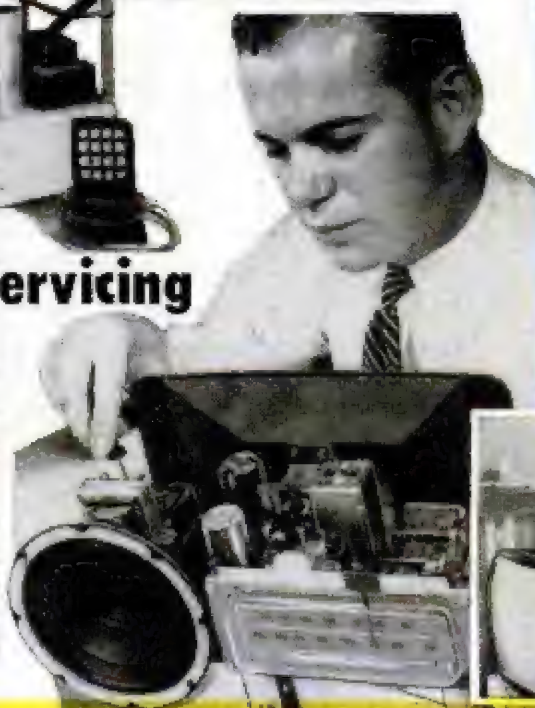
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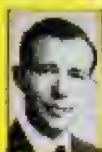


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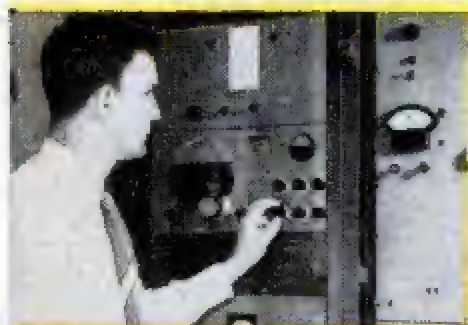


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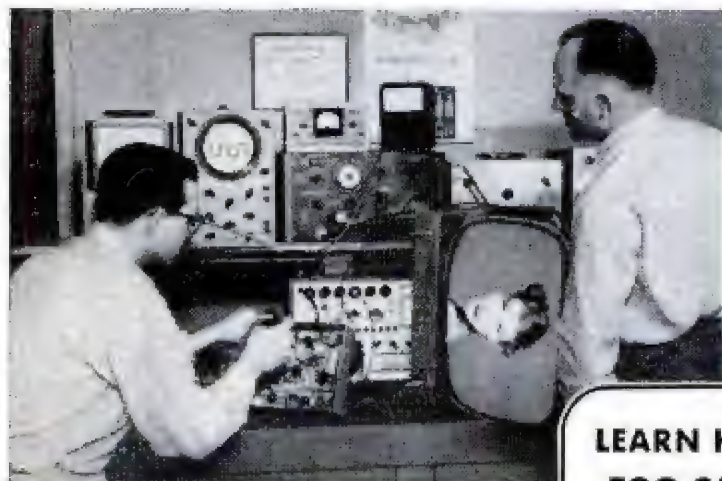
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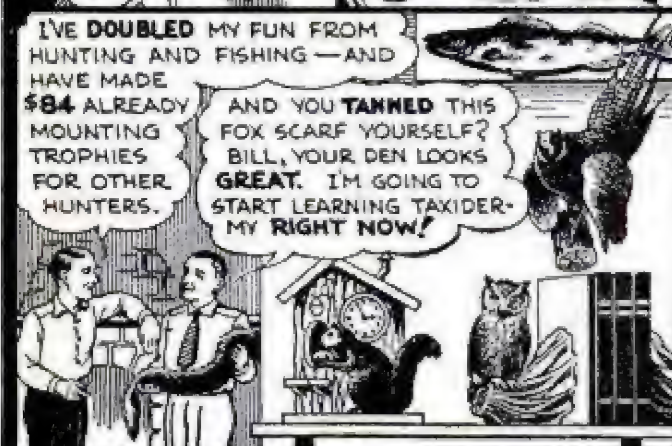
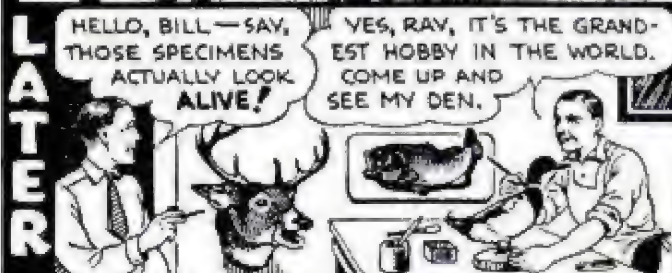
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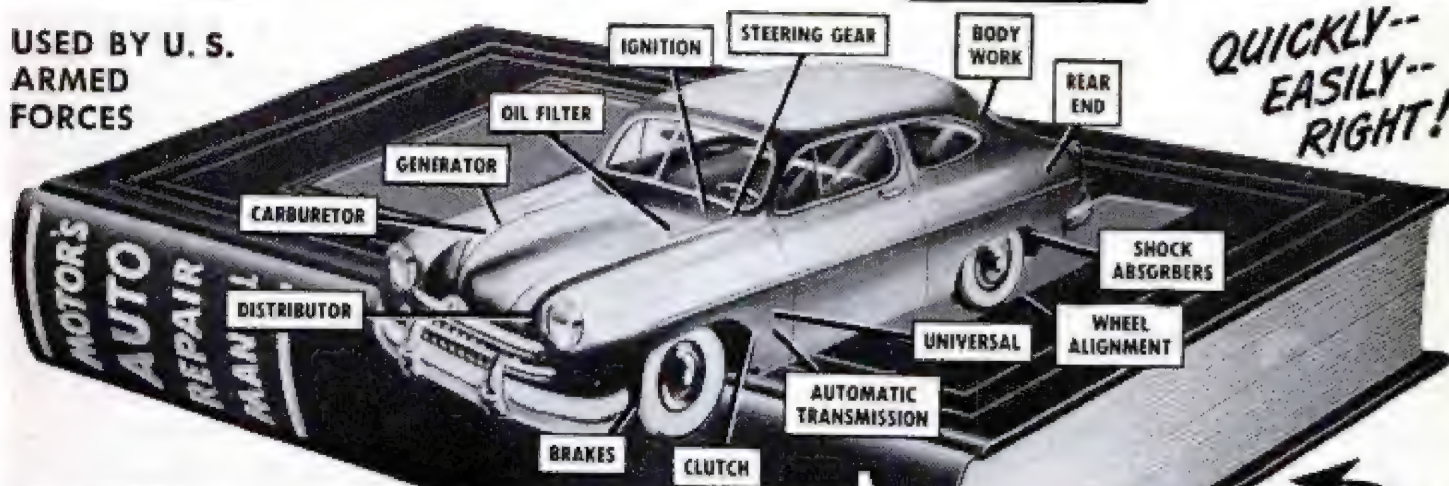
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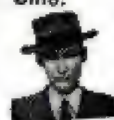
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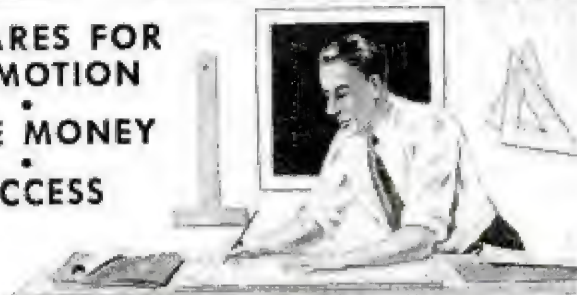
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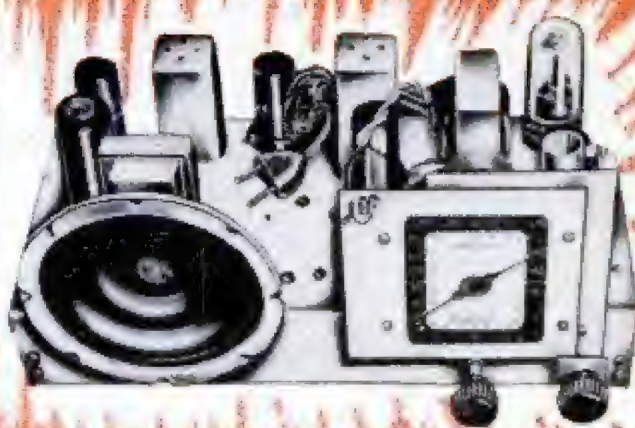
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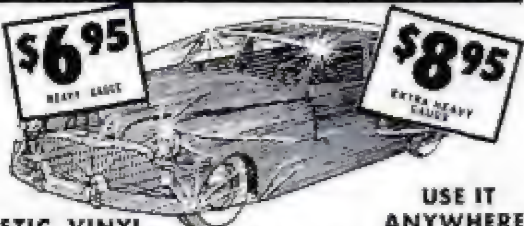
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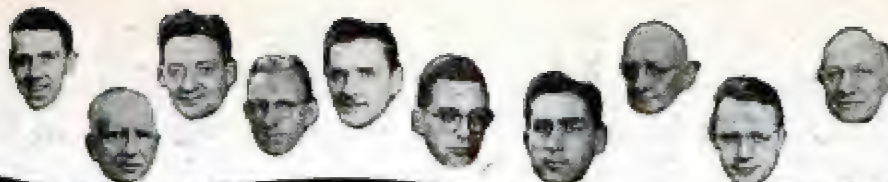
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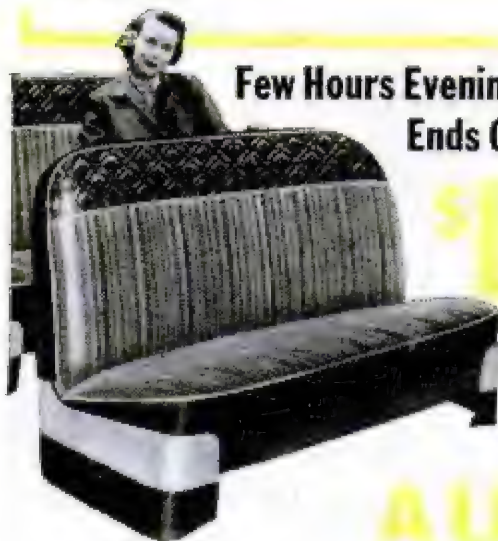
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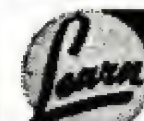
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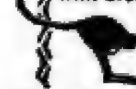
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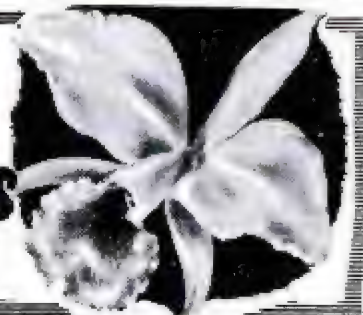
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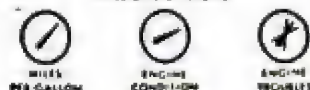
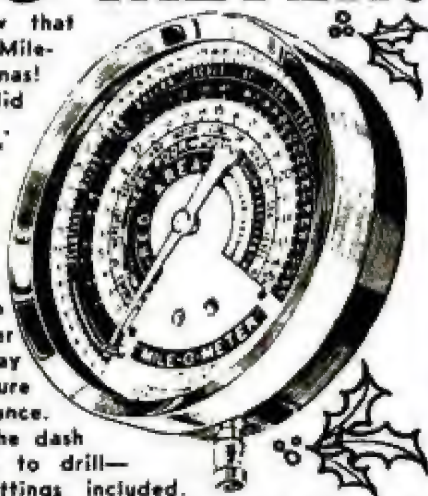
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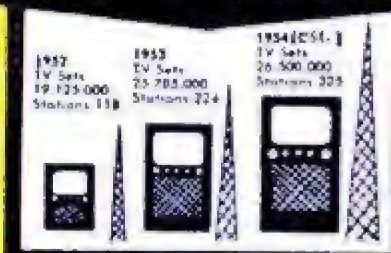
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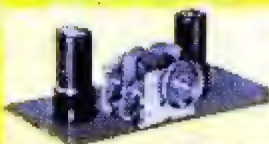


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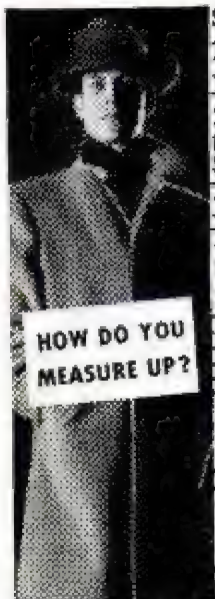
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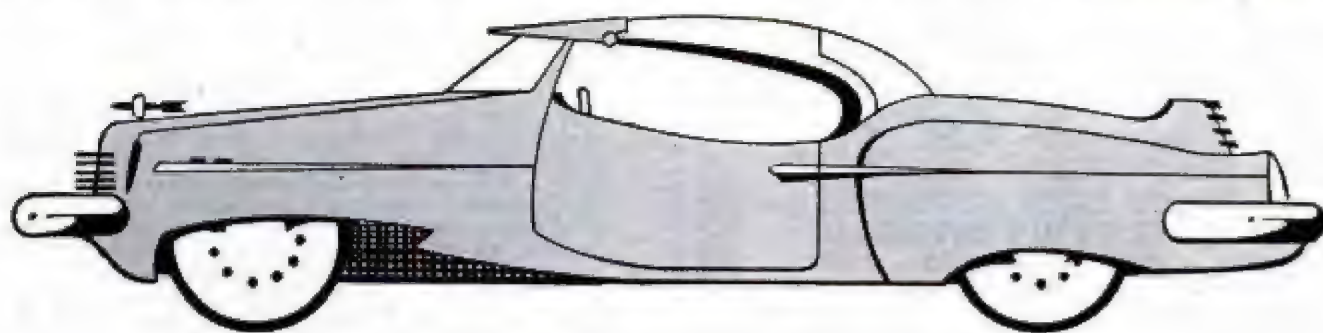
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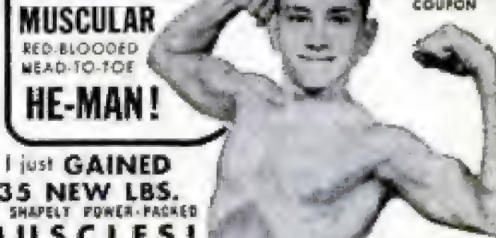
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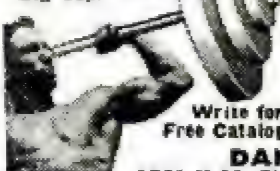
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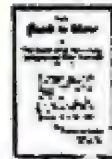


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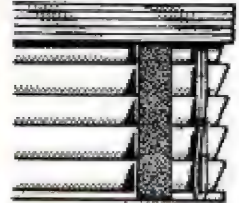
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CRYSTAL Radio kit, guaranteed to work, \$1.50; phone \$1.75. Clearco Crystal Co., Dept. 9, 1229—25th, Des Moines 11, Iowa.

CLEARCO Crystal radio kit \$1.50; preassembled \$1.75. Free catalogue. Clearco Crystal Co., Box 1857, Milwaukee, Wis.

MAKE Simple, tubeless, batteryless distance-getting crystal radios. Crystal and illustrated instructions 25c postpaid. Allen, 427-P, Clinton, Missouri.

CRYSTAL Radio experimenters. Write Leslie Hulet, R4, Lakewood, New Jersey.

EXPERIMENTERS' Plans, diagrams, booklets. Free catalog. Dittotax, 5208-1 Onacrest, Los Angeles 43.

BUILD 15 Radios—Only \$19.95 complete. Free radio tester, tools, soldering iron. No experience required. Money-back guarantee. Order direct or send for descriptive literature. Free, valuable radio and TV repair guide on request. Progressive Electronics, 497 Union Ave., Dept. PM11, Brooklyn 11, N. Y.

SAVE 25% On all popular brands of tape recorders. Send post card describing wants. Free literature. Morgan & Brownell, Algonquin, Illinois.

SENSATIONAL Television development! Instantly eliminates annoying commercials. 100% profit. Franklin, 2156-W, Los Angeles 54.

SIMPLEST Capacity relay yet! Uses no idling power. Ideal for trick locks, scare 'em gadgets, burglar alarms, operating window displays. Complete schematic, illustrated set-up instructions, 50c postpaid. Not mimeographed sheets. Technix Laboratories, 5680 Riley, Buffalo 8, N. Y.

TALKIE Crystalphone — Nearest thing to a real walkie talkie. Talk and receive radio programs. Instructions 50c. Talkie Crystalphone, Valley Road, Box 27, Clark-Rahway, N. J.

ZENITH Super symphony FM-AM \$63.00. Save 25% on packaged HI-FI, Webcor Musicale, Motorola Sonora. All models of Columbia "360" series. Hallicrafter and V-M. RCA stratoworld, 7-band a.c.-d.c., climatized portable, \$195.00. Webcor Holiday phonograph \$69.50. Send postcard describing wants. Free literature. Morgan & Brownell, Algonquin, Illinois.

TWO Way radio. No license to operate. Send \$1.00. Bullock's, 1910 Montgomery, St. Louis, Mo.

TELEVISION Interference eliminated with amazing, easily installed, guaranteed, antenna high-pass filter. Unbelievable! Only \$1.00 postpaid. BMB Co., Box 8, Hillside Manor Branch, New Hyde Park, N. Y.

2-WAY Intercomm. Uses no power. Pair \$4.95, plans \$1.00. Ray's, 6631 Ashbury, Afton, Missouri.

COLOR Television! Enjoy multi-color filter screen now. Easily attached. Send \$2 for your screen size. Satisfaction guaranteed. Dealers opportunity. Zingo Products, Johnstown 7, New York.

BUSINESS OPPORTUNITIES

MAKE Money selling by mail; instructive booklet 25c. Manhattan House, P.O. Box 51-M, Saint Albans 12, N. Y.

EARN More money, 137 Elite plans, Free information. Jorine, Snuyders Lake, Troy 4, N. Y.

START Small business. Stir your imagination with over 100 business plans. Free information. Shore Enterprises, Box 91-G, Little Ferry, N. J.

MADE \$24,500 Using money making plans from world's oldest mailorder publication. Scherer Magazine, Canfield 1, Ohio. Year \$1.00. Sample 20c.

OWN A garden golf business. Experience unnecessary. Brockway, Seaside, Oregon.

WHERE To buy at wholesale 100,000 articles. Free list. Also extra-income information. Maywoods, 1133 Broadway, New York.

BE First amazing mentalist. Exclusive territory. Profitably entertain. Mystic Hadley, Rehoboth Beach, Delaware.

UNUSUAL Homework opportunity, sparetime, men, women. Angora House, PM, Springfield, Illinois.

MAKE Rubber stamps, repair dolls; learn silk screen printing; invisible reweaving. Catalogue (88 ideas) free. Universal, Box 1076-A, Peoria, Ill.

EARN Money! Amazing plans! Easily mastered at home. Details free. Bruns, Room 612B, 216 West Jackson Boulevard, Chicago 6, Ill.

OWN, Operate, route Wishing Wells. Place these new \$8.50 skill games on counters in cafes, luncheonettes, clubs, etc. Collect coins weekly. Write, Legalsharr, Box 929, Long Beach 1, California.

HOME Business opportunity. Mail literature to auto owners. Everything furnished. Big earnings. Eastern, Box 142-F, Dorchester 24, Mass.

WE Love our mailman—He leaves over \$1,000.00 monthly in our rural mailbox. My college professor husband drafted a scientific home mailorder method. We bought a Texas ranch, live as we always wanted. Now we sell the Ranch Mailorder Method. Operates anywhere. Inquire: Eveningshade Ranch, Helotes, Texas.

HAVE New York address with mail service \$2 month. 616 Fifth Ave., Suite 1004, New York.

OPERATE Escalator mailorder system, selling our products or any products. Fastest, most revolutionary mailorder system known. Write: Selbyco, Decatur 181, Ill.

YOU Can be notary public. Information free. Magnolia Press, Box 1272-P, Burbank, Calif.

MAKE Money; sell by mail; Money Getter's, monthly magazine shows how! Sample 10c, 3 months 25c, year \$1.00. Hurry! Dispensa Co., 2020 Harbor Ave., Ashtabula, Ohio.

\$25 WEEKLY Working two hours daily at home. Lycke, Box 2471-A, Cleveland 12, Ohio.

START Your own profitable home mailorder business! We supply everything! Write today! Studio Products, Box 564-A, Glendale 5, Calif.

WHOLESALE Of sensational nationally advertised appliances, silverware, watches, cameras, etc. Start your own business. Full details. Send 50c for catalogue. International Sales Co., 175 Fifth Ave., New York 10, N. Y.

HOW And where to obtain capital? Free details. Star Service, Wapakoneta, Ohio.

LIVING Miniature ("Ming") trees only 10 to 20 inches tall. Grow at home. Big profits! Spare time opportunity. Fascinating! Amazing! Write for free seed and plan. National Nursery, Dept. FC, Inglewood 4, California.

BUY It wholesale! Manufacturers, distributors offer 850,000 items. Literature free. Olsen, 1231-A East Third St., Duluth 5, Minn.

BREED Rare tropical fish at home. Earn big money! Learn secrets! Help fill huge demand. Amazing opportunity! Free plan. Tropicals, 1008-F Los Angeles St., Los Angeles 15.

INCOME From local information. No selling. Write Neherco, La Verne, Calif.

RESILVERING Mirrors, formula 50c; two-way lookout mirrors, (No one sees you), 50c; coppered mirrors, 50c. All \$1.00. Nelko-Mir, Box 3462-J, Chicago 54.

FIGURINE Molds and many others, liquid rubber, statuary plasters, flock finishes, Glo-candle wax, etc. Illustrated catalog and "Plastercraft" manual free. Blue Rapids Supply, Blue Rapids, Kansas.

START Home manufacturing business. Make cleaners, soaps, polishes, cosmetics. Free literature. Kemix, Park Ridge, Ill.

MAKE Money spare or full time, casting metal toys and novelties. Big wholesale and chain store demand for autos, soldiers, ashtrays, banks, etc., keeps manufacturers busy. Production moulds furnished for up to 100 and more castings per hour. No experience or special place necessary. Write for information and illustrations of patterns needed. Metal Cast Products Co., Dept. A, 1696 Boston Road, New York 60, N. Y.

NEW Exceptionally profitable plans, ideas for home operated mail business. Rush name. Miller, 1772-P Carlyon Road, East Cleveland 12, Ohio.

MAKE Flexible molds! Cast plaques, bookends, figurines! Free sample! H. Tonker, 630-B Chestnut, Hamilton, Ohio.

RECAST Old batteries into new. Latest achievements. Battery Laboratories, Minneapolis.

READ "Advance"—The voice of mail order. Offers money-making opportunities, sources of supply, personal guidance, etc. Issued monthly. Sample copy 35c. Yearly subscription \$2.00. Advance Publishing Company, 313 East 21st Street, Suite 450, New York 10, N. Y.

GOOD Paying business silvering mirrors, plating autotaps, reflectors, bicycles, bathroom fixtures, etc., by late method. No tanks or shop required. Outfit furnished. Free booklet. Gunmetal Co., Ave. H, Decatur, Illinois.

BUY Wholesale. Thousands articles. Supply directory, 10c. Idealco, Park Ridge, Illinois.

EARN Extra money! "Homeworker Magazine" tells how. Sample 25c. Sizemore, Box 7, 4817 Kostner, Chicago 30.

EXTRA Money—No selling, operate vendors. Amazing profits, details free. Silver King, Suite 220, 822 Diversey, Chicago 14.

OPERATE Profitable mail order business. Write Walter Service, 4139-A East 112th, Cleveland 5, Ohio.

DOLLARS In personalized baby record books. Sell by mail. Use same literature we do. No-Co-Ro, Oakland 6, Calif.

MINK Raising information free. Complete. Lake Superior Mink Farm, Superior. EEI, Wisconsin.

COPUBLISH Leading, m.o. paper. Latest copy. Mail Sale Advertiser, details, dime. Vanroy Shirk, Lebanon, Penna.

COLORGLAZED Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. National Potteries Company, Grand Rapids, Minnesota.

FREE Book "505 Odd, Successful Businesses." Work home. Expect something odd! Pacific, Oceanside, Calif.

START Venetian blind laundry. Profitable lifetime business. New machine. Free booklet, P. C. Co., 442 N. Seneca, Wichita 12, Kansas.

137 PLANS For starting home business. Details: Elite Co., 220 Grand St., New York 13.

MAKE Perfume. Sell on smell. Mail order or local. Wilson made \$7300.00 first year. Free sample, plan revealed. McCann, 4019-21 Rio Grande, Amarillo, Texas.

LEARN Metalizing baby shoes, gifts, etc. Bronze, gold, silver. Folio free. Kiklavli, 7217-PM South Broadway, Los Angeles 3.

LIQUID Rubber, make flexible molds. Free sample. Chaney, 1130 E. 16th St., Jacksonville 6, Fla.

FLX Typewriters. Free booklet describes our modern, inexpensive home-study course. Factory methods taught. Write Typewriter, Building 1, Tarentum, Penna.

MONEY In new greaseless doughnuts. Start in kitchen. No smoke. Sell stores. Free recipes. M. Ray Company, 3605 South 15th Ave., Minneapolis 7, Minn.

POPCORN And potato chip equipment. Long Eakins Company, 5360 High, Springfield 9, Ohio.

START A lettershop on a shoestring! Sales \$56,000. Started \$36.00. Information? Merritt, Box 13, Basking Ridge, N. J.

MAKE Money at home as renewal headquarters for all magazines. Big Christmas sales profits now. Liberal commissions. Supplies furnished. Write for free catalog. McGregor Magazines Agency, Dept. 500 B, Mount Morris, Ill.

NATURAL Molding latex. Tinsel, flock, supplies. Extra thick. Free sample. W. Wooley, 115-A Donald, Peoria, Ill.

EARN Big money by mail. Depression-proof income. Circular 10 cents. Complete starting deal \$3.00 postpaid. Reho, Box 21A, Whitsett, Penna.

FREE Electroplating information. Money making plans. Send postcard for your copy. Highly paid, interesting, uncrowded field. Plater M. Hyde, 327 West 120th Street, Los Angeles 61, California.

FREE Details! Home operated mailorder business. Successful beginner's plan. Everything supplied. Lynn, 10420-M National, Los Angeles 34, California.

VENDING Machines—No selling. Operate a route of coin machines and earn amazing profits. 32-page catalog free. Parkway Machine Corporation, Dept. 72, 715 Enzor St., Baltimore 2, Md.

FLEXIBLE Rubber moulds for plaster and Marblite figurines. Sample and large illustrated catalog 25c, refunded on first order. K-C Novelties, Dept. 73, Easthampton, Mass.

50 HOME Mail business plans! Proven money-makers! Personal help assures success. Verdo, B-37A, Huntsville, Missouri.

UNUSUAL Opportunity. Sell by mail—Books, merchandise. Complete setup. Write Sherron, Box 343P, Bloomfield, N. J.

BOOKKEEPERS. Increase earnings operating sensational bookkeeping service. Kern, 4942 Vineland, No. Hollywood, Calif.

LEFT 8 Hour job to take 14 hour, and love it! Working for myself, at home, it's different. Special mailorder procedure we developed (spot-mailings from different points over United States) allows me much leisure, and double enough to live on. I'm showing others how. Write: Cirves, 2834 W. 65th, Chicago 29, Illinois.

PEOPLE Write us they'd like to live as we do, rural, tranquil, with our home business, and money coming daily in the mail, and would we show them how? Yes. If you have capital, at least for postage and mail-order circulars, we'll get you safely started. Inquire: Craig, Southern Pines, North Carolina.

ESCAPE Wage slavery. Easily. Operate your own profitable lifetime business. Free literature. Corley, R186 Ackerman, Clifton, New Jersey.

HAVE Home mail business—Get \$10 orders in every mail. Keep \$8.00. Everything furnished. Hutchinson, 401-A Adams, Dorchester 22, Mass.

ASK Your wife if you love your job. She knows. Then write me about the mailorder method I perfected in 1929, that's dropped \$1,000 into my mailbox every month since, that lets me stay home and enjoy life working for myself. I'll help you start. Rotoletter, 1160 Seward, Detroit 2, Mich.

FREE Vending machines; if used to sell our profitable nuts. Continental, Box 1361-A, Milwaukee 1, Wisconsin.

BOOKKEEPERS. Keep books, small firms spare time. Manual latest technique by C.P.A., \$3.00. Modern Business, Box 406, Youngstown 1, Ohio.

FREE Booklet — "How to Make Money by Raising Fishworms." Please include 25c for postage and handling. Flint River Worm Farm, Reynolds 5, Georgia.

DON'T Fail to read our advertisement under **Money-making Opportunities**. Profecto Products Company, Box #543, Oak Park, Illinois.

MAKE More money! Operate a profitable spare time business from your home. Learn how you can buy at wholesale prices. Write today for free folder "F." The Giftery, P.O. Box 12, Cincinnati 13, Ohio.

FACTORY Distributors for Lubri-Loy. Amazing oil concentrated guaranteed to make any car run better. Sell to automotive service dealers for resale to car owners. Exclusive sales rights. Excellent repeat sales. Earnings over \$10,000.00 a year. Lubri-Loy Company, 6325 Wilson Ave., St. Louis 10, Missouri.

BIG Money—Amazing new home business. Pearl finish baby shoes. Free plan. Pearl Art. 7216 Bear, Bell 1, Calif.

START A buying service, buy wholesale thousands nationally advertised products. Make big profits selling at sizable discounts. Postcard brings details. American Buyers, 627-P Linden, Buffalo, N. Y.

INDUSTRIALISTS — Businessmen. Investigate Florida. Rapidly-growing Florida offers innumerable opportunities for business and large and small industries and a highly favorable tax situation. Write State of Florida, telling type of business you're seeking and specific requirements. You'll be put in touch with communities where opportunities exist and where you'll enjoy Florida's wonderful year-round climate. Free, complete information will be sent you. Write today: State of Florida, Industrial Development Division, 4314A Caldwell Building, Tallahassee, Florida.

RAISE Orchids—At home. Big profits. Fascinating. Year 'round any climate. No greenhouse. Instructions, including blooming-size orchid plant, sent for no-risk examination. Free details. Flowerland, 4622-DR, Wilshire, Los Angeles 5.

EARN Amazing profits by following our instructions; selling nationally advertised watches, etc. Enclose 25c, refundable; receive multi-colored salesman's catalog and confidential price list. Result Sales Co. 580 Fifth Ave., New York.

BE Your own boss! Huge assortment home-business plans. Free details. Green Enterprises, 179 Fillmore Street, Yonkers, N. Y.

WANTED! Men-women! Read how others have made big money in their own home plastics business. Spare or full time. There's still room for you. No experience or special education needed. (Also colorful liquid marble details and beautiful plastic tile sample.) Free catalog. Write today! Bing Products, PM-1053, Watertown 72, Mass.

FREE! "301 Profitable Small Businesses!" Amazing shoestring plans! Work home! Start sparetime! Deumant Surveys, Kenmore 23-PM, N. Y.

HOW To raise needed funds. Free details. Enterprise Bureau, Syracuse 2-P, N. Y.

LEARN Refrigeration mechanics. Complete illustrated course. Free booklet. Mechanics School, 7217-PM South Broadway, Los Angeles 3.

BIG Profits, manufacture night glowing varnish. Chemicals, formula, \$1.00. Ceramic Products, Box 6321, Birmingham 7, Ala.

100 FINEST Steel double edge razor blades \$1.00. Carl Bohman, 110 Union Street, Schenectady, New York.

FREE Folder "How to make \$2400 per year selling \$1 books by mail." Wieland, 7601 Main, Kansas City 14, Missouri.

SELL Popular Mechanics and all other magazine subscriptions. Free catalog. supplies. Subscription Service Company, Dept. A, P.O. Box 2070, Birmingham, Ala.

BUY Wholesale from nationally advertised manufacturers, distributors. Literature free. Carter Publications, Box 6011-F, Chicago 80.

SPARE Time business. No investment. Details free. Howell, 1320 St. Andrew, N-w Orleans 13, La.

MAKE Money at home. Easy; pleasant; profitable. Paton, Box 55-E, New York 23, N. Y.

START Home mail order business. Details. Gedgard, Box 798-X, New York 1, N. Y.

SAVE Postage. Register your name with us. Receive mail dealers best offers without writing them. Only 25c. Falcon House, Winnebago, Ill.

WANT Profitable hobby? Try weaving potholders. Card brings particulars. Morgan's Hobby Supplies, Dept. C, Indiana, Penna.

BUY 250,000 Articles wholesale. Directory 10c. Publishers, Box 1485-P11, Detroit 31.

BRONZED Baby shoe supplies, instructions, mountings. Metal bookends, \$1.50 pair. Free catalog. National Bronze Supply, Box 56, Los Angeles 32, Calif.

LIQUID Marble—Colorful, glossy! Molded, brushed, sprayed! Cast novelties, statuary, colored tiles. Flexible molds. Composition floors. Particulars free. Marbleizing Service, Edwardsville, Illinois.

MAKE Tough, durable plastic—1c pound. Makes attractive floors, walls, built-ins, roof. Build good home \$150.00 room. Bays Laboratory, Oklahoma City 9.

IMPORTING, Exporting! Profitable details free. Warner's, Box 6, Fort Scott, Kansas.

PERFUMERS; Cut costs, 500 fragrances, supplies. Box 3267, San Diego, Calif.

PROFITABLE Home mail business. Details free. Service Bureau, Box 596, Toronto, Canada.

GROW Plants, flowers. Details free. Shiffer, Box 129, Millersburg, Penna.

FISHWORMS. Breeders 100—\$1.00. Manual \$1.00. Postpaid. Literature free. Dixdick, Kent, Ohio.

QUICK Money! Repairing car batteries. At home! Easy, too! Batteryman, Grand Junction, Colorado.

WHOLESALE Prices—Known brands television, appliances, jewelry, sporting goods, furniture, etc. Send \$1.00 large catalog. Hamilton Sales Company, York, Nebraska.

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OPERATE Profitable garden, experience unnecessary. Proven plans sent you. Yusko Products, R#3, Streator 18, Illinois.

EARN Money at home, making rhinestone jewelry. Free catalog. Ebert, Box P183, East Orange, New Jersey.

TYPISTS Become public stenographer. Shorthand unnecessary. Unique, profitable. Free with purchase "Typewriter Profits" \$1.00. Arnolds, Box 524d, Sacramento 6, California.

MAGAZINE Agents. Largest commissions. Bonus. Qualified Publications, 451 A Kingston, Brooklyn 25, N. Y.

OPERATE Profitable collection agency. Become co-partner! Interesting details. Write: Edmondson, Box 4665-P, Atlanta 2, Georgia.

"HOW To Build Your Own Mailorder Business." 25c. Guaranteed. E. Merrill, Coldbrook Road, Bangor, Maine.

YOUR Own 200% profit business. Imported real feather bird pictures. Sample 20 cents. With hand carved frame and glass, \$2.00 value, \$1.00 p.p. Free details. Specialty Products Co., 301 New Market Ave., So. Plainfield, N. J.

MAKE Money sharpening saws at home, spare or full time. \$100 starts you. No selling. Free booklet tells how. Victor Foley Company, Columbia Heights, Minnesota.

LEARN Sewing machine repair, electrify, rent, trade, sell. Make up to \$150 week spare time setup. Motor kits, zigzag machines, etc., wholesale. Free particulars. Taylor Service, Hamilton PM-11, Ohio.

START Your own business on credit. Your own boss. 1658 of our dealers sold \$5,000 to \$27,500 in 1952. We supply stocks, equipment on credit. 200 home necessities. Sales experience unnecessary. Pleasant profitable business backed by world-wide industry. Write Rawleigh's, Dept. K-U-PPM, Freeport, Ill.

IMPORT-Export! Opportunity, profitable, world-wide, mail-order business from home, without capital; or travel abroad. Established World Trader ships instructions for no-risk examination. Experience unnecessary. Free details. Mellinger 70B, Los Angeles 24.

INVISIBLE Reweaving in big demand! Cash in servicing laundries, cleaners, stores, homes. Make tears, holes, cuts disappear from fabrics. Earn up to \$10.00 in an hour. Details free. Fabricon, Dept. C-11, 8342 S. Prairie, Chicago 19, Illinois.

MAKE Perfume. Catalog free. International, 6347 Parnell-PM-11, Chicago 21, Illinois.

PERMANIZE, Ceramize, porcelainize, metalize baby-shoes, crochet items, hundreds of keepsakes. No baking, no firing. Fantastic profits. Details for 25c. No equipment to buy! Jay Sales, Dept. 2-M, 192 N. Clark, Chicago.

NEWEST Spare, full-time home business. \$5 to \$10 hour possible. Paint with suede—The finish with touch and eye-appeal. Beautifully auto dashboards, signs, radios, toys, figurines, lamps—1001 others. Complete, step-by-step instructions sent for no-risk examination. Free details. Coast, 1004-HX So. Los Angeles St., Los Angeles 15.

ADVERTISING Book matches—Cash in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. MX-1153, 7530 Greenwood, Chicago.

PROFITABLE Opportunities, magazines—Dime. Far Hills, Box 644-MC, Dayton 9, Ohio.

EARN \$50 Weekly in spare time. Lifetime vitamin business. Details free! Emm-Bee, Dept. PM, Box 992, New York 8, N. Y.

MAKE Products. Sell mailorder. Formula catalogue free. Imasco, 6347 Parnell-PM-11, Chicago 21, Illinois.

COLOR Concrete with chemicals. Marble-glaze cement benches, pottery, garden ornaments. Home—shop. 10c brings sample, pictures. Hollywood Cementcraft, 8527-R Wonderland, Hollywood 46, Calif.

BUY Wholesale thousands nationally advertised products. Save money! Make money! Postcard brings details. Kemah Company, 5017-P Washington, Houston 7, Texas.

SUNNY California land bargains as low as \$5.00 per acre. Low down payments—Low monthly payments. Write for free information. Land Department, Suite 105, 1540 N. Highland Ave., Hollywood 28, Calif.

BARGAINS. Big monthly tabloid paper lists hundreds bankrupt, closeout, wholesale bargains. Many bargains 15c-20c on detail dollar! Lists sources 100,000 items wholesale. 6 months, \$1.00; 1 year \$2.00, regular \$3.00. Tower, Box 591-SH, Lynn, Mass.

WHAT'S Your field of interest? Whatever it is, specialized magazines will help you to greater success. Look over current copies of those covering your field through our easy-to-get-acquainted service. Choose from 4,387 publications covering all fields—business, vocational, agricultural, sports, hobbies, etc. Write for current list. It's free. Commercial Engraving Publishing Company, 340 North Ritter, Indianapolis 19, Indiana.

\$1000 MONTHLY! Successful nationwide business. Puraclean, 17-B East 42nd, New York 17.

\$10,800 PROFITS! Your own mailorder business! No risk! "Success Plan" free! Treasury, 709 Webster, New Rochelle LB-1, New York.

NEW Warm kitchen without extra heater. Even Temp. Manufact., Thornburg, Ark.

SENSATIONAL Television development! Instantly eliminates annoying commercials. Free details. Franklin, 2156-B, Los Angeles 54.

LET Others sell for you. Earn steady from home. Full set-up service from idea to success. Free information. Hermes Company, 152-H West 42, New York.

MAILORDER Business book. Full information for the beginner. Write Brown's Agency, Box 491, Tacoma, Wash.

EARN Money with typewriter—Sewing machine! Details free. Edwards, 3915-PM, 12th, Des Moines 13, Iowa.

LEARN Mailorder. Money-making opportunity. Work home. Literature free. Addison, 1840-P Addison, Chicago 13.

OPERATE Profitable mail order business. Splendid opportunity. Details. Write Frank Hawkins, 2806 Wenzel, Kansas City 3, Mo.

SUCCESSFUL Money-making plans. Home or mail-order. Details free. Stowell's, Woodstock, N. Y.

BE Notary public. Rate higher. Details free. Stationers, Helotes, Texas.

WANTED! Men—women! Read how others have made big money in their own home plastics business. Spare or full time work. There's still room for you. No experience needed. Free catalog. Write today! Bing Products, PM-1153, Watertown 72, Mass.

STERLING Silver religious medals, chains, gift boxed. \$2.90 retailer, \$1.00 ppd. Imprints, drop shipments. Unique. 412-A Hendrix, Brooklyn 7, N. Y.

WANTED! Home producers, by manufacturers in our clearing house service. Become a subcontractor, casting plastic products for these companies. Thousands of easy-to-make items required for consumer and industrial use. Cash in at home, without previous experience. Write Plastic Service Associates, Dept. PM8, East Boston 28, Mass.

FOOD Mailorder business. Home operated. Everything supplied. Successful proven plan. Free details. Frasar Foods, Desert Springs 10, California.

BUY Nylons direct from mill. Good profits. Quick delivery. Write for jobbers prices. Joy Hosiery Mills, Delawanna 38, New Jersey.

SELL By mail. New 10,000 word booklet shows how. At home. Sparetime. Small capital. 25c. Satisfaction guaranteed. Vernon-Hall, Box 193M, Abington 11, Penna.

EARN Big money resilvering mirrors. Instructions and formula \$1.00. Ray Fuiks, Box 248, Buffalo, Texas.

CATALOG Of top mail order plans and folios, proven and tested. Stamp please. Lindholm Service, P.O.B. 2504, St. Ann Station, Minneapolis, Minn.

CLEAN Watches for profit. Solvent and directions \$3. General Chemicals, Box 827, Pittsfield, Mass.

START A telephone answering service in your home. Profitable life time business. Postcard brings details. Telephone Answering Service Consulting Co., Box 293-1, Lexington, Mass.

WE Pay \$5.00 for some names. Make steady income sending us names. We buy thousands. Pacific, Box 73136, Los Angeles 3.

\$46 FROM Square foot plywood; jigsaw necessary. Write: Woodarts, Bridgewater, Mass.

FREE Instructions—Metallizing baby shoes. Mountings. Posters, 1520 Ardmore, Chicago 26.

QUICK Sign painting. Use letter patterns, avoid sloppy work, wasted time. Write for sample. John Rahn, A1330 Central, Chicago 51.

COPUBLISH The Advertiser. Free advertising. Sample paper and plan 10c. Eagle, 751-P Jackson, Bronx 56, N. Y.

NEW Gift item. Just out. Free details. Boyd's, Galena, Missouri.

EARN \$200 Weekly operating your own buying service. No investment needed. Postcard brings free details. Citizen Buyers, Box 4523, Oklahoma City, Okla.

MAKE Perfumes and cosmetics at home. Write, Carey Laboratories, 1914 Chouteau, PM-11, St. Louis 3, Missouri.

LEARN Piano tuning at home in five weeks. Big demand. Earn \$6 hour full or spare time. Write: Empire School, 602E University, Champaign, Illinois.

CASH in during coming income tax season. Establish profitable dignified tax return business. Experience unnecessary. Free prospectus. Union Institute, Lakewood 2-E, N. J.

INTERESTING Literature, novelties, magazines, catalogs, 25c. Ohio Sales, Box 116, Kent 4, Ohio.

ELECTROPLATING. Profitable home business. Auto parts, novelties, giftware, mirrors. Easy, inexpensive home processes. Free booklet. Tyco Metals, Box 13231-MK, Houston 19, Texas.

SUNNY Florida, healthful, cheaper. Spend winter! Furnished apartments \$35.00 week. Reservations, near ocean. Information. Pal Parker, Flagler Beach.

STOP Money worries! Own profitable business. Easy at home mail order sales. No merchandise investment. Write Specialty Products, PM-3, Mt. Holly Springs, Penna.

BUILD Luggage and cases at home. We sell your products. No special tools or equipment needed. Free details. Casecraft, 605-AB Sunset Blvd., Los Angeles.

PROFITABLE Countrylife, security, happiness. 100 tested plans. Inquire. Hermes, 152-L West 42, New York.

FREE Mailing lists! Directory gives over 300 sources furnishing millions of mail order prospects without charge. Write for full information. Research House, 3810 Merrill, West Palm Beach, Florida.

ORGANIZE! Guaranteed steady profitable renting-repairing-selling service of tools, appliances, supplies, instruments, etc. Everyone needs them! Complete course; first lesson free. Alltools, Box 268, New York 5.

NOTICE: Get, use, sell Missionary Scheall's new \$5.00 guaranteed automatic fire extinguisher grenades. Buy one, get three. Write Scheall, 263XX, Duluth, Minnesota.

EARN \$2.00 Hour! I do, making sandals. Youngs, 1308-PM, South First, Arcadia, California.

FREE Catalog! 50 home money-making opportunities! Maxson, Box 488, Falls Church 25, Virginia.

100 TESTED. Money-making plans. Dime. Regal, Box 173, Royal Oak, Mich.

FORECAST Cost of advertising your product, invention, business. Advertising Computer reveals typical rates. Covers 50 magazines, newspapers, radio, television stations. Useful! \$1.00. Adagency, Box 418, Seattle 11, Washington.

MONEYMAKING OPPORTUNITIES

LEARN Professional candy making, profitable home business. Details free. Pate, Kissimmee, Florida.

MAKE \$2600.00 A year spending 5 hours a week. Start at home. New machine. Small investment. Free booklet. A.X. Co., 442 N. Seneca, Wichita 12, Kansas.

DON'T Be Mr. Average Man. Operate your own business. New field, sensational sales potential, highly profitable. Very desirable, non-perishable, no chemicals or liquids. High-grade proposition for men not afraid of earning \$10,000 and up annually. Can you recognize real opportunity? Postcard will bring details. Protecto Products Company, Box 5443, Oak Park, Illinois.

FREE Folder. Dozens of new, different ways to make money at home. Write, Pomona Publications, Box 357-B, Pomona, California.

STOP Shopping! See our complete catalog of spare time opportunities. Free. Rush postal. Lewis Enterprises, P.O. Box 2367, Portland 14, Oregon.

HOW To earn up to \$500 for each script writing for television. New, different. Particulars free! Wonderful Products, Box 2113, Santa Fe, N. M.

SELL Jewelry by mail. Big demand, every woman buys. Everything furnished. Eastern, Box 142-D, Dorchester 24, Mass.

CHURCHES. Women's clubs, receive \$100.00 to \$500.00 and 24-card tables. Unique plan. Pine Hill, New Jersey.

101 WAYS To make \$1,000 at home. Details free. Business Surveys, 385 S. Fairfax, Los Angeles 48, Calif.

HAVE Money-making home mail business. Complete idea. Mailbox service. Personal help assures success. NMD Agency, Box 88-A, Dorchester 22, Mass.

START Your own business manufacturing driftwood lamps. Kit \$7.50. Sam Patchett, 2187 N.W. 24th Court, Miami, Florida.

WOULD You see your boy in your job? Does the job satisfy? Inspire you? Bring \$1,000 paycheck? My modest home mail-order does. In 24 years I've learned to avoid mistakes, cut corners, conduct a profitable, satisfying operation. If desired, I'll help you start, guide you. Thomas Cummings, 3070 Felton, Salem, Oregon.

BORROWED \$45 For stamps and circulars. To date sold quarter million dollars—In small orders! All from home, by novel mailorder method where we supply circulars to mailers in certain key positions. Orders come automatically, average \$40 daily. Now we're showing others how. Details free. Hometrend, Marshall, Illinois.

DIME Brings our nationally advertised opportunity packet. Rinehart, 235 Baltimore, Hanover, Penna.

SELL Titania gems; \$9.75 carat wholesale. More brilliant than diamonds. Free catalogue. Diamonite, 1404-M Mitchell, Oakland 1, California.

50,000 ARTICLES Wholesale. Source directory, dime. Nelko, Box 3462-DR, Chicago 54.

FOUR Ways to increase your income at home. Free details, Dixie Mailers, King, N. C.

SCHOOL Seniors—Sell classmates America's most beautiful graduation name cards. Largest selection. Highest commission. Outsell all others. Free sample kit. Printcraft, Dept. M, 1509 Maple Street, Scranton 5, Penna.

MONEY Found. Be our agent in your community. Top quality watches, diamonds, jewelry, etc., at wholesale prices. Amazing profits. No age limit. Experience unnecessary. Send for free catalog. Zeroh Brothers, 602 Mission Street, Dept. 81, San Francisco 5, Calif.

READ Progressive Mailtrade, the magazine that tells how to make money by mail. Dime brings sample and special offer. Progressive Mailtrade, Box 357, Sheboygan, Wisconsin.

START A profitable subscription business in spare time! We need men and women (young or old) as representatives for all leading national magazines. Liberal commissions paid for new and renewal subscriptions. Start earning money in this pleasant work at once! Clip this ad and send with your name and address to: International Circulation Distributors, Dept. PM, Hearst Magazines, 250 W. 55th St., New York 19, N. Y.

FREE Book "505 Odd, Successful Businesses." Work home. Expect something odd! Pacific, Oceanside, Calif.

137 PLANS To make money, local mail-order. Details: Elite Co., 220 Grand St., New York 13.

PUBLISH Your own magazine. Handsome 52 page format, well edited, illustrated. Cost low as \$1.00 month. Brings you prestige, profits. 25c brings sample, details. National, Ord, Nebr.

PAUZE Liquid styptic stops bleeding quickly. Fast profits. Sampler 25c. Pauze, 1545-F Echo Park Ave., Los Angeles 26.

MAILORDER—Operate profitable home business using free advertising method reaching millions. Revealing information free. H. F. Seidel, 7070 Hollywood Blvd., Hollywood 28, California.

22 MILES Out of city I live, yet walk to work daily, to my office, a renovated barn 50 feet away! I planned it that way. We organized a home mailorder, a rare kind, branch-style. United States Postal Service approved. Grosses \$1,000 monthly. Organization duplicatable using other products. Inquire: Kerr, Gering, Nebraska.

MAKE Money at home by mail. Fast, easy. Liebig Industries, Beaver Dam 4, Wisconsin.

MAKE Cosmetics in your kitchen for own use or to sell. Easy, profitable, not seasonal. Ingredients available at drug stores. Twenty one formulas and instructions \$1.00. Moffet, 429 N. Gilbert, Danville, Illinois.

MAKE To \$4.50 hour doing common pen lettering. National Artists, 801½-A North Marshall, Dallas 3, Texas.

EXTRA Income! Become a notary public! Complete details, your state, 50c! Filmer, 910 Marion, Pharr 10, Texas.

GET Facts—\$4.00 merchandise, \$2.00 treatise 100 money makers. \$6.00 value \$2.00. Kohne, 506 West 45th, Chicago 9.

SPARETIME Profits taking subscriptions, all magazines. Wholesale catalog free. Cassell Agency, Westfield 2, New Jersey.

ROSARIES—Make your own! For gifts, fun, profit! See complete line of religious goods, gold-filled and sterling rosary parts. Medals, books, statues, novelties. Big group of make-it-yourself items. Send 10c for new wholesale illustrated catalogue just off the press, bigger than ever! Greylock Creations, Box 1048-PM, Pittsfield, Mass.

FREE! "301 Profitable Small Businesses!" Amazing shoestring plans! Work home! Start sparetime! Deumant Surveys, Kenmore 23-PM, N. Y.

"DOLLAR Maker Tips." Stamp brings details and free gift. Flatwoods, Leesburg, Fla.

FREE Samples, diagrams, instructions. Completely new, enormously profitable business. Send 25c coin for handling. Hobby, 243 S. Lexington, St. Paul 5, Minn.

STRANGE Dry window cleaner. Sells like wild. Replaces messy rags, liquids. Simply glide over glass. Samples sent on trial. Kristee, 180, Akron, Ohio.

BUY Printing and office supplies wholesale. 10,000 items. Details free. Royal, Box 368-A, Cleveland 27, Ohio.

START A buying service, buy wholesale thousands nationally advertised products. Make big profits selling at sizable discounts. Postcard brings details. American Buyers, 630-P Linden, Buffalo, N. Y.

\$1,000, \$4,000, \$10,000 BEING Made spare time at home. Simple mail-order secrets shows you step by step. Details 25c. Port Books, P.O. Box 453, Port Chester, N. Y.

EARN Money evenings, copying and duplicating comic cartoons for advertisers. Adservice, Argyle 1, Wisconsin.

CASH In. Get into mail order business—68 page book reveals business secrets, effective advertising, what to sell, beginners advice. Numerous tested and original money-making plans. Over 40,000 words. We'll include other helpful literature. Send only 25c to: Par Products, 2185 Bolton St., New York 62, N. Y.

EXTRA Money. No selling. No investment. Details free. Progressive Ideas, 51-A Clover Hill, Mt. Holly, N. J.

FREE Folder! Make money at home. Samuel Tell, Guaynabo, Puerto Rico.

TYPEWRITER Owners. Make handsome profits. Get details today. Groves Company, 682, Hastings 8, Nebraska.

FOREIGN Employment construction work. If interested in foreign projects with high pay write Foreign Service Bureau, (Dept. P.M.), Metuchen, New Jersey.

GENERAL Contest Bulletin. Issued monthly. Sample, 10c. 1609½ East 5th, Duluth, Minn.

FREE! Complete mailorder business! Terrific profits! No investment. Write today. VitaMins, 2908-PM Beverly Boulevard, Los Angeles 57.

BE Appointed notary public, your state. Greatly reduced costs. Thrilling experiences. Additional income. Men, women. Young, old. Write Box 3025, Dallas 1, Texas.

101 WAYS To make \$1000 at home. Details free. Business Surveys, 365 So. Fairfax, Los Angeles 39, Calif.

MINIATURE Trees— Why pay \$2.00-\$5.00 for growing secrets? Free details. Bassett, Dept. B, 5038 N. Winthrop, Chicago 40.

500% PROFIT! Boxed jewelry. Catalogue free! Jewelry-of-Season, 703 Industrialtrust Building, Providence, R. I.

MAKE T.V. antennas. Huge profits. Kit for 3, \$4.95. Plans \$1.00. Ray's, 6631 Ashbury, Affton, Missouri.

BUY Wholesale— Thousands nationally advertised items. Save, make money! Free details. Durex Co., Box 672-G, Chicago 90, Ill.

ORNAMENTAL Iron railings. Highly profitable business. No special tools required. Complete instructions \$1.00. Belfro, Box 45, Fond du Lac, Wisconsin.

MAKE Money rehanging crooked pictures in offices, homes, hotels, etc. New, patented picture hanger keeps pictures straight permanently. Thousands being sold. Profitable wholesale and mailorder opportunities. 25c gets demonstrator and full information. Select-A-Level, 1122 National City Bldg., Dallas, Texas.

EARN \$50 Weekly in home operated mail business. We show you how. Write Lewis Bartlett, Richland, Georgia.

\$10,800 PROFITS! Your own mailorder business! No risk! Success plan free! Treasury, 709 Webster, New Rochelle, PM-17, N. Y.

FREE Folder! How to make thousands yearly selling by mail the way that pays. Fuller, 92-A, Greenwood, Pocatello, Ida.

"HOW To Make Money With Simple Cartoons"—A book everyone who likes to draw should have. It is free; no obligation. Simply address Cartoonists' Exchange, Dept. 911CM, Pleasant Hill, Ohio.

GROCERIES Without cost! Guaranteed! Free information! Jaydee, Box 664, Woodland 3, California.

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BUY Wholesale! Nationally advertised products. Tremendous discounts. Particulars free. Econ-O-Mart, Box 535B, Morristown, New Jersey.

AFRICAN Exports— Wholesale leather goods. Send \$3.00 for sample and literature. Drown, B.P.O. Box 302, Tangier, Morocco.

BUY Wholesale— thousands nationally advertised products. Save money! Make money! Postcard brings details. Kemah Company, 5017-L Washington, Houston 7, Texas.

MAKE Money at home, it's easy. I'll show you how and help you. Write: Allen, Box 4A, Houma, Louisiana.

CEYLON Curios, gems, American testimonials, Unique opportunity. John Rajapakse, Negombo, Ceylon.

BEAUTIFUL Feather pictures. 200% profit! Free sample. Apartado 9036, Mexico 1, D. F.

ATOMIC Energy Commission expanding rapidly. Types of commodities you can sell and who to contact. Start small, grow big. \$1.00. Sandy Sales and Services, 1016 N. 8th, Mt. Vernon, Ill.

HOUSEWIVES! Make Xmas money! Toy samples. Unique sales plan \$1.00! Hurry! Kringle Products, Box 575, Hollywood 28, California.

NEW Plastic engraving, carving machine, "Dupliscale." Fun and profits carving plastics! Details, sample 25c. Desco Distributors, 6334-Y Sepulveda, Van Nuys, Calif.

BUILD Fireplaces—The very best, for yourself and others. Scientific principle, different. Heats wonderfully well, does not smoke, no metal shells or dampers, build of rock, brick, etc. Instructions with working model \$4.85. Master Fireplaces, 730 State St., Bellingham, Wash.

33 IDEAS For home workers. Free details. Sterling, Great Neck 57, N. Y.

WINNING Prize contests is fabulous, confidential, home opportunity! Send stamp! National Contest Bulletin, Box 2685-P, Miami 16, Florida.

THE Newest most practical, most fascinating carving knife ever made. Write Harold's Supply Company, Box 2644, South Bend, Indiana.

SCHUHMACHER Matmakers. Convert old tires into dollars. Devote full or spare time. S and S Patents, Inc., 1307 North Clark St., Chicago 10, Ill.

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PERFUME Manufacturing formulas. Fragrance Research Foundation, 1513 Oxford Way, Oklahoma City, Oklahoma.

FORMULAS: Big demand, easily prepared, profitable. Free list. Wall, 304N 27th Street, Alabama City, Alabama.

REAL Manufacturing formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

ANY Formula \$3.00. Chemical Instruction Sheet—catalog 10c. J. Belfort, 216 W. Jackson, Chicago 6.

FREE Formula catalog. Anything analyzed \$35. Western Chemical, Salem, Ore.

LABORATORY Tested formulas. Catalog free. Pont Chemical Company, Terre Haute 2, Indiana.

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500 MONEY Making formulas. 25c postpaid. Allen, Dept. PMC, Clinton, Missouri.

FORMULAS: All kinds. Latest, best. Literature free. Kemikal, Park Ridge, Ill.

GENUINE Manufacturing formulas. Latest. Literature free. Nelko, 3462-P Merchandise Mart, Chicago 54.

SALTED-In-the-shell peanuts. Learn this interesting and secret process direct from the man with over thirty years experience. A formula of inestimable value. Send \$1.00 for complete details of process and instructions to B. & W. Nut Co., 932 S. Wilder St., St. Paul 5, Minn.

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ANY Formula. Jack, Consulting Chemist, 5138 Gairnor Road, Philadelphia 31, Penna.

PLASTICS

FIBEROLAS. Polyester, Plexiglas, Acetate, Vinylite: casting, coating plastics. My own Fiberglass "how" book now ready, \$2.50. Fast service, best prices. Catalog 10c. Airmailed 35c. Gem-O-Lite, Box 6867P, North Hollywood, California.

PLASTIC. Sheets, rods, tubes, etc. Free list. Plastic Supply Co., 2901 N. Grand Blvd., St. Louis 7, Mo.

PLEXIGLAS Sheets— Cut to size. Clear. All thicknesses. Standard outdoor translucent colors. McClarin Plastics, P.O. Box 168, Hanover, Penna.

DIRECTORY Of manufacturers, for liquid plastics, liquid rubber, wholesale. Castleco, 2138P, Paterson, New Jersey.

PLASTICS. Cements, dyes, findings, carvings. Wholesale prices. 64 page catalog free "Trace and Carve" pattern book for carving and coloring fish, birds, animals, only 35c. Taylor & Art, Inc., 1710 East 12th Street, Oakland 6, California.

LEARN Plastics at home. Complete course—\$5.98 postpaid. Dime brings sample plastic, three experiments, full details. Plastic Projects, Box 5151, Detroit 35, Mich.

PLEXIGLAS. Lucite. Any size sheets. Square foot (12 x 12) cost, 1/16", \$1.13, 1/8", \$1.55, 3/16", \$1.90, 1/4", \$2.25. Add 15% for postage. Minimum order \$3.00. Almac Plastics, 600 Broadway, New York City.

PLASTICS Home-craft course for men and women. Tells and shows how to make hundreds of fast selling plastics products. All plastics and materials for 23 projects included in course. No special tools needed. Course pays for itself. Write for free booklet. Interstate Training Service, Dept. D3M, Portland 13, Oregon.

NEW Liquid casting plastic. Clear, colors. Embed flowers, insects, coins. Saw, drill, carve. Send 25c for Castolite Creations Manual and proved success plan showing how to make money at home. Castolite, Dept. M-101, Woodstock, Ill.

UNUSUAL Christmas decorative materials fill our complete catalogue. Van Horn Plastics, 1905 Ingersoll, Des Moines, Iowa.

CHEMISTRY

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 25c. Dept. M-50, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N. Y.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology, 10c. Tracey Laboratories, Evanston, Illinois.

NEW Idea chemical and apparatus outfit for home experimenting. Photo-scales, microscopes, chemicals, biological and laboratory supplies in small quantities. Catalog 25c. Established 1931. John H. Winn, 124A West 23rd Street, New York, N. Y.

SPECTROSCOPE For quick chemical analysis \$3.00. Kutting Sons, Los Altos, Calif.

CHEMICALS. Supply catalog, 15c. Laboratory Sales, Box 161-A, Brighton, Mass.

IMPROVED Second printing. "Spectacular Chemical Experiments" manual. Not mimeographed sheets. Contains complete formulas, set-ups, data, on thermites, fulminates, explosive powders, etc. Still \$1.00 postpaid. Chemi-Technix Laboratories, 568CJ Riley, Buffalo 8, New York.

AMAZINO New book of science. Experiments, formulas and catalogue of laboratory supplies. Only 25c. National Scientific Co., Dept. 16, 2204 W. North Ave., Chicago 47, Illinois.

CHEMISTRY Step by step: A painstakingly designed course for those denied formal schooling in this modern giant among the sciences. Not a plaything. Not a toy. Fascinating, absorbing, breath-taking experiments. A whole new world of exciting adventure. Cultural. Practical. First lesson free. Parkway Laboratory, 1004 Second Ave., Pittsburgh 19, Penna.

AGENTS WANTED

YOU Can make a fortune if you join us now. Sell sensational new \$4.95 non-electrical burglar alarm. Tremendous sales. Federal Products, Evanston 2, Illinois.

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EASY Handwork makes fast-selling useful articles. Sample free. Sunmade Company, Brockton 64, Massachusetts.

AGENTS Wanted: Sell household appliances. Send for wholesale catalog. Nueblings, Sicklerville-P, N. J.

FOG-Stop windshield cloth. Instantly removes blurry mist, frost, sleet, snow. Stops windshield fogging. Samples sent on trial. Kristee 124, Akron, Ohio.

101 WAYS To make \$1,000 at home. Details free. Business Surveys, 365 S. Fairfax, Los Angeles 49, Calif.

SENSATIONAL New plan! Large wholesaler of appliances, cameras, watches, etc. will start you in new type of business. No selling. Free details. Cam Company, 6605PM-20th Ave., Brooklyn 4, N. Y.

SCHOOL Seniors—Have fun and spending money! Be popular with your classmates. Send postal for details. Craftcards, Box 235-L, Pittsburgh 19, Penna.

STRIKE It rich with flannel backs. Scientific tablecover marvel not plastic, not linen, better than either. Outlasts 16 years scrubbing. Show free samples. Take orders. Pocket juicy profits. Styleco, Dept. 399, Cincinnati 10, Ohio.

PRINTING, Salesbooks, envelopes. Free illustrated catalog. Erasco, Dept. PM, Bronx 72, N. Y.

GOLD, Silver lacquered letters. Windows, doors, trucks. Standard sizes. Penny and up. Big profits. Samples. Atlas-D, 544 West 79th, Chicago 20.

MAKE Extra money. Sell front door name plates to friends, neighbors. Retail \$1.98; you make \$1.00! Free selling kit. Modern Engraving Co., P.O. Box 194, Boston 14, Mass.

ABSOLUTELY Free—Sales kit. Yours for the asking. Send postcard today requesting kit showing new line, belt buckles with your name or personal initials, cap badges, choice 3000 different emblems. Write Hook-Fast, Box 1425PM, Providence, R. I.

YOUR Own business—Used suits \$1.50, overcoats 65c, mackinaws 35c, shoes 12½c, ladies coats 30c, dresses 15c. Enormous profits. Catalog free. Moro, 558-AA Roosevelt, Chicago 7.

CALIFORNIA Sweet smelling beads. Sensational sellers. Free particulars. Mission, 2328PM West Pico, Los Angeles 6, Calif.

AGENTS: Stamping names on key protectors. Sample 25c. Stamping outfits, checks, social security and name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

AGENTS—300% Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Sign Letter Co., 421-D North Clark, Chicago.

\$30 WEEKLY Selling finest razor blades, other items. Free details. Edisons, Box 274, Far Rockaway, N. Y.

EXCELLENT Sideline for printing and advertising salesmen. Decalcomania name plates in small quantities. Great demand. Also, make money with our line of automobile initials and sign letters. Free samples. "Ralco" XL-Roxbury, Boston 19, Mass.

\$1.00 PROFIT Selling \$2.95 photo enlargement deal. Allen Studio, Riegler Bldg., Little Rock, Ark.

MAKE Christmas money at home. Take renewals and subscriptions for all magazines. Big Christmas profits now. Liberal commissions. Everything furnished. Free catalog. Write McGregor Magazine Agency, Dept. 500 A, Mount Morris, Ill.

SENSATIONAL Bargains—Profits! Used suits \$1.75, pants 35c, dresses 20c, shoes 20c. Operate from store, home, car. Free catalog. Superior, 1250-A Jefferson, Chicago 7.

BEST Source for wholesale nylons. 25 years dependable service. Fields Hosiery, 99-G Chauncy, Boston, Mass.

ATTENTION Jobbers, wagon men, church groups, etc. Sell Silver Grill. Amazing new magnesium alloy silver. Large profit. Send 75c for sample. Information. Portland Specialty Sales, Portland, Michigan.

MAKE Money spare time plus new car as encouragement bonus. No house-to-house canvassing required. Amazing 60 cleaner cleans immediately, automatically, gauge nylons 3 pairs guaranteed 3 months or replaced free. Write Wilkmit, 17311 Wash., Greenfield, Ohio.

MAKE Money introducing world's cutest children's dresses. Big selection adorable styles. Low prices. Complete display free. Rush name. Harford, Dept. K-5341, Cincinnati 25, Ohio.

BUY Wholesale thousands nationally advertised products at big discount. Free wholesale plan. American Buyers, 629-P Linden, Buffalo, N. Y.

MAKE Money selling name and address stickers for Christmas. \$1.00. Foster's, 1509 Atlantic Ave., Atlantic City, N. J.

MEXICAN Feather pictures. High profits! Fast sellers! Adelphi, Box 57-B, Bellevue 26, N. Y.

MONEY Makers now. 20" wood-chain saw. Rotohoe. Terms. Prepaid. Farmco, 51, Excelsior Springs, Mo.

TELE-Pep (TV) unit \$2.95. Sensation. Radio advertised. Smith Agency-VPM, Excelsior Springs, Mo.

NEW And unusual merchandise. E. Eller, 1000 Sutter St., San Francisco 9, Calif.

AGENTS-Salesmen: Sell beautiful hand colored plastic enlargements and sensational new personalized photo compacts, rings, bracelets, lockets, etc. Experience unnecessary. 40% advance commissions. We deliver, collect. Wonderful sideline—Better full time. Free sample outfit. Novel Portrait Co., 3343 North Ave., Chicago, Ill.

BUY Wholesale. 25,000 items. Catalogue 25c. Matthews, 1472-B2 Broadway, New York City 36.

AGENTS—Show America's leading nationally advertised line—Novelties, gifts, utility items. 100% profits. Prospects everywhere. Steady repeats. Write today for sensational low prices, free literature. Charms & Cain, 407-PM-113 South Dearborn, Chicago, Ill.

SELL Simulated engraved business cards. Profitable! Gooch, 202PM, Hernando, Miss.

LIFETIME Vitamin business! Sell sensational food supplement! Regular \$3.00 size (month's supply) \$1.50 postpaid. Money back guarantee. National Health Products, Dept. PM, 150 Broadway, New York 38.

BUY Wholesale and save 50% on big name merchandise, Xmas gifts. Make big profits selling your friends or for your own use. Our 1953 catalog is ready. Rake, 607-PM Spring Garden, Philadelphia 23, Penna.

BUY Wholesale thousands nationally advertised products. Save money! Make money! Postcard brings details. Kemah Company, 5017-K Washington, Houston 7, Texas.

PROFIT Packed Christmas sales. Famous brand French perfume, eau de cologne. Combination perfume-manicure cutlery gift sets, wildfire sellers. Lowest factory prices. Giant profit and bonus plan. Free testers with sample order. Write for free catalog. Lido Products, 128 Bleeker St., Dept. P-2, New York.

SENSATIONAL Television development! Instantly eliminates annoying commercials. Sample \$2.95. Franklin, 2156-A, Los Angeles 54.

EASY Extra income—Sell new sensational scorch-resistant ironing-board cover. Good Housekeeping approved. Write for free complete selling kit. Menell Products, P.O. Box 431, Midtown Station, New York 18, N. Y.

SPARE Time profit. Catalog. Information, \$1.00. Eric Strickland, 4540 Kelsey, North Kansas City 16, Mo.

FREE Hosiery! Introduce sensational hosiery by giving every man and woman free trial pair to prove how good they are! Amazing nylon stockings guaranteed against runs and snags. New miracle one-size nylon two-way stretch socks. Contain no elastic yet fit any size foot. Never sag. Comfortable like second skin. Actually guaranteed one full year. Earn to \$3 hour in spare time. Mail postcard for free sample stocking and money-making outfits. Absolutely no obligation. Kendex, Babylon 63, N. Y.

ORIENTAL Magic age calculator. Determines anyone's exact age in 1 minute. Guaranteed accurate. Amazing party game. 100% profit. Details, sample 25c. Heller, 455 E. 7th, Brooklyn 18, N. Y.

MEN—Women: 100% profit taking orders for Sweet Georgia Brown beauty products. Tremendous demand by colored clientele. Sample offer. Valmor, 2451-BE Michigan, Chicago 18.

MEXICAN Feather pictures. Sell on sight; 200% profit! Free details. Sample 20c stamps. No coins. Sylviap, Apartado 9036, Mexico City.

EXTRA Money. Jewelry—Each piece an original, will not be duplicated. Details free. Paas Laboratory, 13 Dogwood Road, West Orange, N. J.

INVEST \$1.00. Earn \$5.00. Write how. R. Heitman, Ph.G., Steeleville, Illinois.

QUALITY Ties—Your profit, 140%. Catalog free. Loren Specialties, 4351-A Flournoy, Chicago 24, Illinois.

BIG Profits selling ties, \$2.00 values, \$5.50 dozen. Free catalog. Empire Cravats, 611A Broadway, New York 12.

BALL Pens \$10.00 gross, d.e. s.e. blades \$4.20 m, novelty flashlights with batteries \$2.25 dozen, assorted plastic ruffled aprons \$1.40 dozen up, needlebooks with threader \$6.25 gross. Lutzker, 871-N East 179th, New York City 59.

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BUY Standard brand watches, dinner-sets, jewelry and ladies' nylon hosiery at rock bottom wholesale prices. Send for catalog with confidential price list. Bargain Merchandise, Dept. P, P.O. Box 66, Bronx 59, New York.

NEW Jobs open in selling. Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 28 E. Jackson, Dept. 17, Chicago 14, Ill.

PROVEN Profits: Magica, back sponge. Patented. Seventeen inch polystyrene handle. Suds as it washes. Soap saver. Sensational sales. Magica Products, Wollaston 70, Mass.

NEW Process, every car owner buys. Lifetime repeats. Profits 100% up. Exclusive territory. Wonder Glaze, Bay Port 7, Mich.

BE A jobber without investment, without inventory. Discounts 50% and more—Even on small orders. Draw from \$250,000 stock. Sell stores, individuals. Profits up to 100%. Terrific line toys, giftwares, appliances, jewelry, over 200 items! Free catalog. Modern Merchandise, Dept. 52, 169 W. Madison, Chicago 2, Illinois.

ANYONE Can sell famous Hoover uniforms for beauty shops, waitresses, nurses, doctors, others. All popular miracle fabrics—nylon, dacron, orlon. Exclusive styles, top quality. Big cash income now, real future. Equipment free. Hoover, Dept. U-100, New York 11, N. Y.

SELL Miracle Orion embroidered work uniforms! Looks, feels, tailors like wool; wears 3 times longer. Outwears cotton 5 to 1. Acid-proof grease-resistant. Washes perfectly pressed. Amazing profits! Outfit free. Topps, Dept. R-5311, Rochester, Indiana.

ADVERTISING Book matches—Cash in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. M-1153, 7530 Greenwood, Chicago 60.

BUY Wholesale thousands nationally advertised products. Save money! Make money! Postcard brings details. Kemah Company, 5017-N Washington, Houston 7, Texas.

SELL Auto seat covers. Up to \$16.50 every order. Sensational new materials; amazing low prices. Full time or spare hours. Own seat covers as bonus. Experience unnecessary. Write for big free sales outfit and samples. Key Products, Dept. 24311, 800 N. Clark St., Chicago 10, Ill.

MONEY Making opportunity! Take big profit orders for world famous patented varieties fruit trees. Also flowering shrubs, roses, vines. Big sales outfit free. Stark Bro's, Desk 30154, Louisiana, Missouri.

SENSATIONAL Money-maker! New portable dishwashing machine sets on drainboard; washes, dries all dishes for average family in minutes, automatically! Ends dishwashing drudgery! Under \$100. Big profit. Easy payment plan. Write Bessen, Dept. 104, 22 W. Division, Chicago 10, Ill.

FROM Failure to over \$50,000 a year. Learn how ex-housepainter enjoys fabulous success in direct selling. Also receive amazing magazine showing you how to make big earnings, spare or full time. Both free. Specialty Salesman, Rm. 510-B, 307 N. Michigan, Chicago 1, Ill.

NO Competition. New invention. Automatic metal traps. 3 samples \$1.00. Automatic, 44 North Albany, Chicago.

IS \$210 A week worth a postcard to you? Then rush card with name and address for special free trial plan that sells amazing new automatic refrigerator defroster like hot cakes! Write to Mr. Lewis, D-Frost-O-Matic Corp., Dept. H-102, 173 W. Madison, Chicago 2, Illinois.

NEW "Tax" expense account report and income tax deduction record, sells on sight. Salesmen, stores, individuals, profit 100% and up. Salesmen, businessmen, auto owner's necessity. 30 second demonstration. Send name and address, demonstrator sent on approval. Dept. PM-102, Box 9013, Houston 11, Texas.

RUN Your own repeat-order shoe business! 3 sales a day brings up to \$63 or more a week extra with fast-selling Consolidated shoes! No experience or investment needed. Fit customers stores are unable to take care of. Special kinds of shoes for different occupations. Send postcard now for free selling outfit! Consolidated Shoe System, Dept. CC-33, Chippewa Falls, Wis.

\$50 DAILY! Amazing atomic powder polishes cars quickly! Details free! 3 car can \$1. Star Dust, 405-A Madison, Fort Wayne, Indiana.

SALESMEN—\$50.00 in a day definitely assured, selling brand new item going to every type of food and beverage store, factories, laboratories, hospitals, etc. Samples furnished. Utility Durawear, 53 West Jackson Blvd., Dept. PM-11, Chicago, Illinois.

AD Matches! Sell amazing designs—20, 30, 40 and 240-light book matches. Bigger spot cash commissions; every business a prospect. Low prices for high quality. Repeats. Start without experience; men, women; full, part time. Buy nothing! Sales kit furnished. Match Corp., Dept. PM-47, Chicago 22, Illinois.

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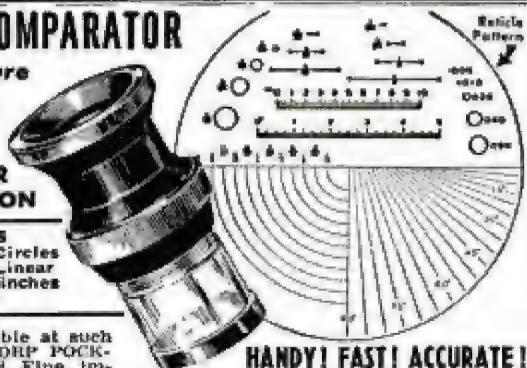
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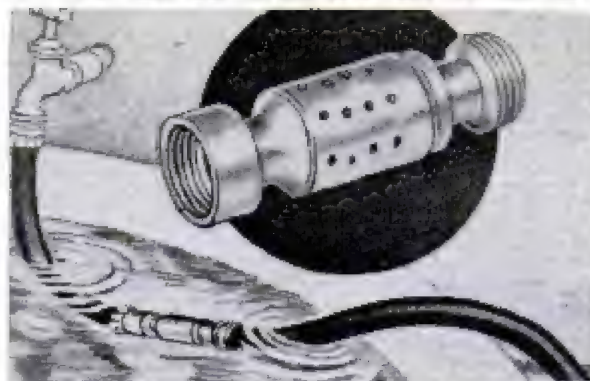
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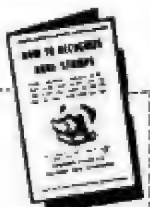
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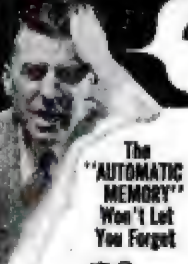
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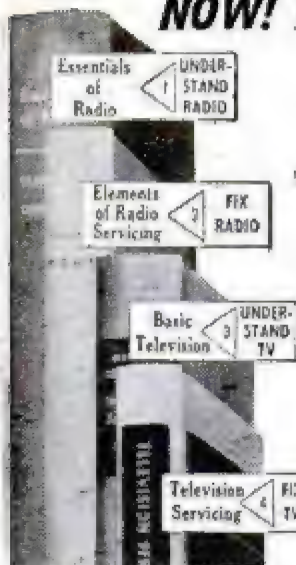


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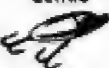
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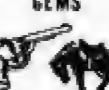
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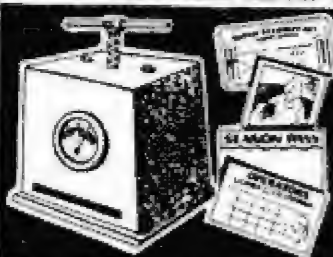


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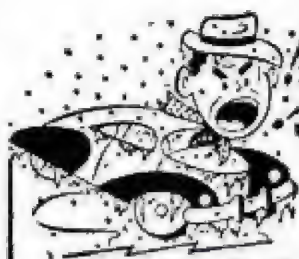
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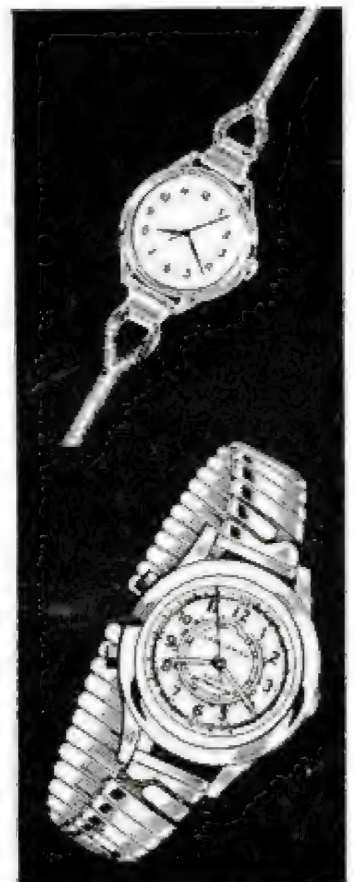
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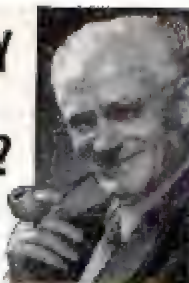
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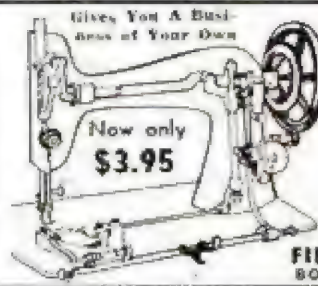
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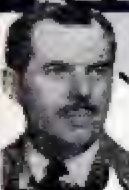


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NOVEMBER 1953

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is where
the
heart
is!



No chrome piston ring set can really give *complete* wear protection in the "heart of the engine" unless it provides a chrome-plated TOP ring, as well as a chrome-plated oil ring. For the top ring operates where heat is highest, pressure is greatest, and lubrication is poorest!

That's why Perfect Circle's 2-in-1 chrome piston ring set has established new standards of ring performance . . . why it seals compression and controls oil for *over twice as long as old style sets!* And only 2-in-1 furnishes an alternate HiPressure spring with each oil ring, for positive control even in badly worn engines!

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PISTON RINGS • The Standard of Comparison

Yes, the heart of any engine is the piston and rod assembly... and Perfect Circle's 2-in-1 chrome piston ring set gives complete protection against wear where the power is produced!

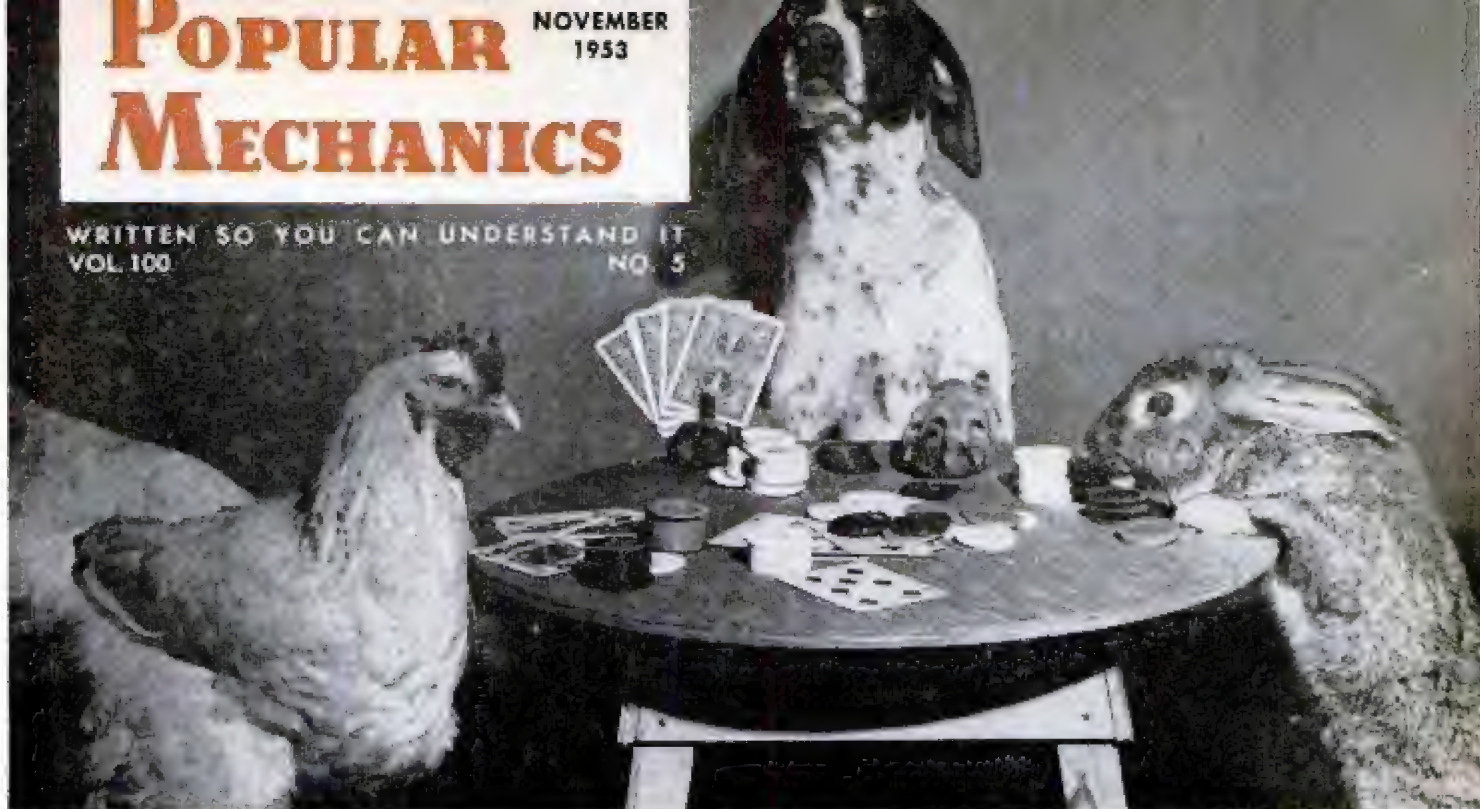


In the 2-in-1 set, solid chrome plating on these ring surfaces resists wear over entire area of ring travel. Cylinders, pistons, and rings are assured double life.

POPULAR MECHANICS

NOVEMBER
1953

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 100 NO. 5



A quiet poker game in the firehouse. Animals learn to take their positions, then remain absolutely motionless

WHO SAYS ANIMALS ARE DUMB?

You can teach any animal—hen or cat, pig or rat. Take a lesson from the Brelands, who teach hens to play baseball and pigs to vacuum the floors. Their educated animals are wowing audiences from coast to coast

By Clifford B. Hicks—Part I

AT A LITTLE FARM near Hot Springs, Ark., I saw a chicken do arithmetic problems and a rooster knock out a tune on a piano. I played a pinball game against a turkey, and invariably lost. I watched a hamster imitate Tarzan on a trapeze, a rabbit play basketball and a dozen chickens swing baseball bats.

After spending a few days in the society

of these incredible creatures, I came away completely convinced that anyone can train an animal or bird, and that most animals can be taught spectacular tricks. You just have to be smarter than the animal.

The Arkansas farm is the research laboratory of Mr. and Mrs. Keller Breland, a pair of graduate psychologists who train animals and birds as a means of studying behavior patterns. By teaching a 10-day-old chick to run up a ramp and ring a bell, a turkey to operate an electric train and a

In 25 minutes, using Brelands' methods, author taught chicken to turn the pages of *Popular Mechanics*. Fowl is rewarded with grain from "reinforcer" at right





Even rabbits can learn the value of thrift. This one takes coins from Breland's lips and saves them until he has enough to "buy" a reward



Money-wise bunny deposits his coins one by one in a piggy bank. Having earned his reward, he's paid off in pellets of rabbit food. Below, this isn't the usual scene at the Breland dinner table, but it isn't unusual either. Rabbit and hen will hold their positions anywhere

rabbit to careen down a slide, these two psychologists are uncovering new and positive means of controlling behavior. Almost as a sideline to their research, the Brelands have developed some infallible new animal-training techniques.

Infallible? Take a look at my own experience.

Soon after I arrived at the Brelands' fascinating laboratory, Keller invaded a chicken coop and brought back an ordinary, untrained young hen.

"Here," he said, handing me the chicken. "You yourself can prove our training methods. What do you want to teach that bird to do?"

After a moment's hesitation, I asked doubtfully whether the hen could be trained to turn the pages of a magazine.

"That shouldn't take more than 30 minutes," Keller said.

I thought he was kidding. Twenty-five minutes later I had my chicken trained to leaf through *Popular Mechanics*, page by page, as often as desired.

Over a period of 12 years Keller and Marian Breland have amassed a good deal of significant information in the field of behaviorism—information on "reinforcement by variable ratios" and "patterns of response." Technical language aside, what they have done is to convert animal training into a science.



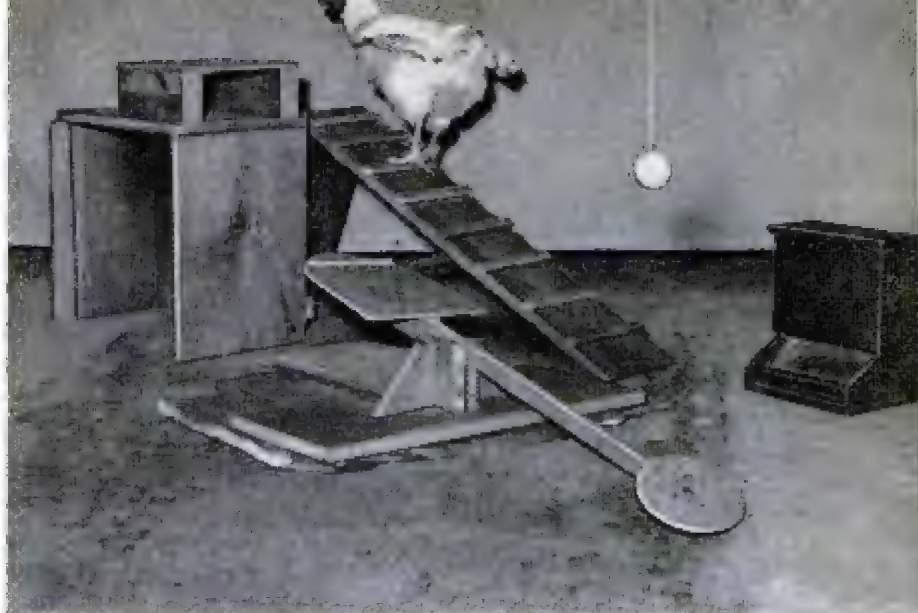
Furthermore, they say that anyone with a basic knowledge of their methods can train a chicken, rabbit, hamster, dog, cat or even a bull to perform tricks on signal.

The modest young Brelands have always been more interested in behavior patterns than in animal training, but some six years ago it occurred to them that their educated chickens might lay them a somewhat golden egg. They suggested to General Mills, Inc., makers of farm feeds, that a tap-dancing hen would be a great crowd-puller at feed stores. They were almost scoffed out of the building until a few of the executives watched a hen do a tap dance while a rooster played the piano. Since that time the Brelands have been working under contract to the company. Some 60 or 70 of their animals and birds are currently touring the country in the hands of feed salesmen, who put them on display at fairs, rodeos and feed stores. Altogether, the Brelands have trained some 4000 animals and birds which have been seen by about 1,000,000 entranced people.

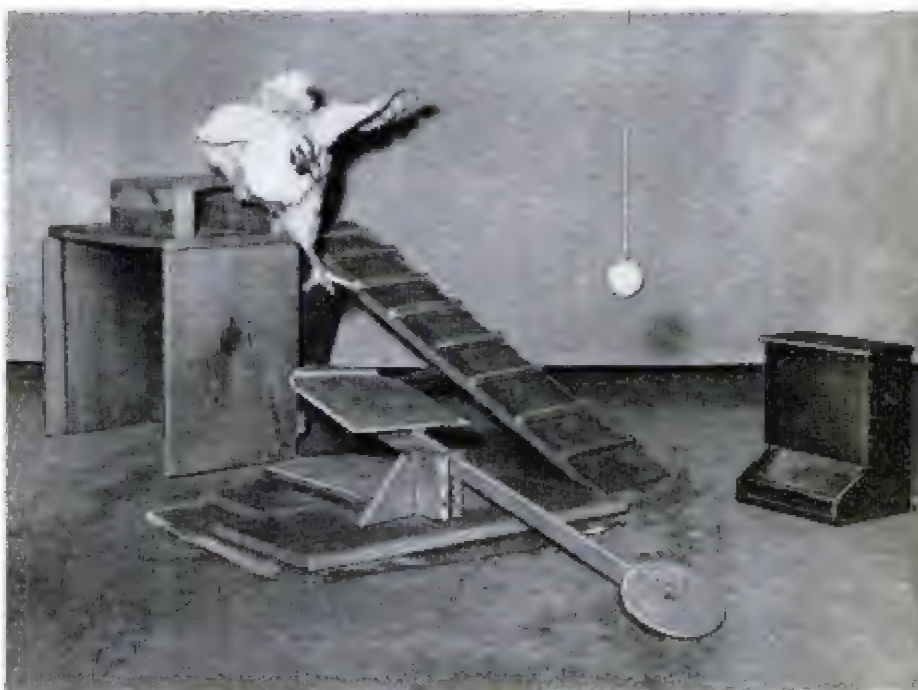
The commercial contract under which they operate is unique because the Brelands absolutely guarantee to control animal behavior. At this moment some 125 Casey-at-the-Bat chickens, scattered across the country, are belting home runs. The Brelands have no idea where they are or who is handling them. They do know that day after day the hens are happily banging baseballs with precise regularity.

The Brelands are unprecedented as animal trainers because they can impart this regularity to any number of animals selected at random. Take Priscilla the Fastidious Pig. Actually there are nine Priscillas, all ordinary porkers without pedigrees, all trained to perform identical and complicated routines without any help from their handlers.

When the act starts, Priscilla is in bed and is awakened by an alarm clock. Clad in a neat house dress, the pig climbs out of bed and ambles over to a radio, which she turns on with her snout. With a soap opera blaring, she daintily seats herself on a chair at the dining table and eats her breakfast



After solving the riddle of this experimental setup, hen will walk through it time after time with no one around. First she climbs up the cleated ramp and jumps over to the platform



Biddy leaps to teeter board. If she flutters down, nothing happens, but if she lands solidly, the other end of the board strikes the ball, which soars to ceiling and trips reinforcer at right. Hen gobbles her reward and starts up the ramp again



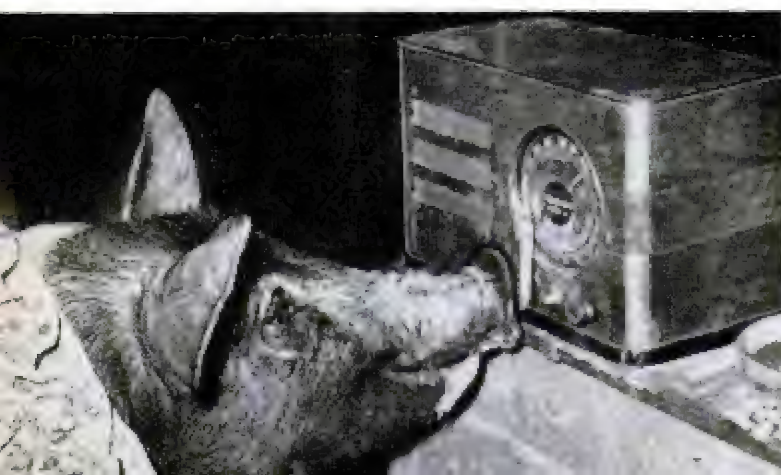


General Mills photo

"Putty," the Brelands' farm dog, can be molded in any position, so it's easy to balance him on table legs



Proud hen wears tapdancing "shoes." When music is played, she clucks and clacks about room, her feet beating out staccato rhythm. Below, "Priscilla the Pig" turns on and tunes radio before doing housework



from a plate. But alas, a housewife's work is never done, so after breakfast she tidies up the room. Scattered about the floor are several items of clothing which she picks up one at a time and drops into a hamper. The pig then trots over to a vacuum cleaner in the corner, flips on the switch with her snout and roots the cleaner back and forth to the hilarious shouts of the audience.

Priscilla's actions are so human that she sends a tickle up your spine, especially when you recall that there are nine of her. All nine are in the hands of amateurs—feed salesmen with no more than two days' training as Priscilla-handlers. The salesman nonchalantly walks down the main street of a country town with Priscilla trotting at "heel" beside him, and within 15 minutes the news has flashed around the village, "There's a pig over in the feed store that thinks it's a housewife!" In one town with a population of 4000, more than 7000 people watched Priscilla.

What are the Brelands' training secrets? No secrets at all, for Keller Breland will explain all the techniques and urge you to try them yourself. Basically they use a "reinforcing stimulus," their scientific term for rewarding an animal or bird instantly when it makes even a random hint of doing what you wish. Although feed is the usual reward, the animals get as much feed as they want; it's just spread over the training period. No animal ever goes hungry, rations are always ample and the Brelands never use punishment in any form.

A bird or animal soon learns to go through an unbelievable number of steps to earn its "reinforcement." Quite by accident I opened one door at the laboratory and saw a lonely hen hard at work on some experimental equipment. With no one around to watch, Biddy would climb up a ramp, then jump across to a platform. There she'd survey the situation for a moment. Below her was the high end of a teeter board. Suddenly she'd leap out into space and land on the board. If she fluttered through the air, using her wings, she'd strike the teeter lightly and settle slowly to the ground. But if she plummeted down without using her wings, landing sharply and solidly on the board, the other end of the teeter would snap into the air, striking a rubber ball suspended on a string from the ceiling. The ball would shoot high in the air, a buzzer would sound and Biddy would cackle happily over to a feed trough and gobble down her reinforcement. Then off she'd go to climb the ramp again.

Keller has developed an electric feeder or "reinforcer" which is the heart of the training. His model is a superbly efficient one, but anyone could work out a similar, if cruder, mechanism. The reinforcer for

chickens is a small box with a feed trough at the bottom. Inside the box are three things: A buzzer, a hopper filled with feed and an electrical mechanism which drops about a dozen grains of feed into the trough when a button is pushed. The button is an ordinary doorbell button on a long wire.

How is an animal actually trained? At the start of my chicken-training session, Breland placed the reinforcer along one side of a card table, handed me the electric button and told me to put the chicken on the table.

"Push the button," he ordered. I pushed it, the buzzer sounded and a few grains of feed dropped into the trough. The chicken whirled around, spotted the grain and ate it. When she walked away, Keller told me to press the button again.

Within two minutes the chicken had learned that the sound of the buzzer meant feed in the trough. Keller then placed a wire rack on the table opposite the reinforcer and leaned an open magazine against it, with the pages slightly "dog-eared."

"Now don't reinforce her until she looks or walks at random toward the magazine," he ordered. "Then give it to her quick."

My hen wandered around for a few seconds, then accidentally drifted toward the magazine. I reinforced her pronto. After a dozen such reinforcements she had a definite pattern of behavior. Cluck cluck, straight to the magazine. Bzzzt. Whirl

around and peck at the feed. Cluck cluck, straight to the magazine. Bzzzt. Don't let anyone tell you a chicken is stupid.

"Now localize her," said Keller. "Don't reinforce her until she looks at the folded corners."

She cackled back over to the magazine and I waited for her to spot the turned-down corners. When she did, I gave her a tremendous buzz. This isolation of a point is the most difficult step, and Biddy required at least a dozen shots of reinforcement before she got the idea.

Finally, I disappointed her. She expected reinforcement when she gazed at the corner, but didn't get any. Made her so mad she pecked viciously at the turned-down page, and immediately she was rewarded.

One minute later she was so eager to please me that she would race over to the magazine, grab a page or two in her beak and pull. Each time she pulled, a page would turn over. Presto—she was turning the pages.

I looked at my watch. The training process had taken only 25 minutes. She kept browsing through the magazine for another 10 minutes until she was full.

We put her away temporarily, but a few hours later when we returned her to the table she immediately began to peck through the pages. A marvelous bird; I think Keller could teach her to read.

(Continued next month)

Another hen pecks out real—though simple—tune on toy piano. She gets "reinforced" from feeder at right

General Mills photo





Airlines Offer Mobile and Drive-In Ticket Offices

Airline tickets now come to the customer—or are purchasable at drive-in ticket offices. In Los Angeles and San Francisco, Trans World Airlines now has roving ticket offices, mounted on truck chassis, traveling over fixed routes. The body has a side-

panel opening for quick conversion to an outside ticket counter. United Airlines has opened a drive-in ticket office for suburbanites living south of San Francisco. A canopied parking area is provided for those desiring information on itineraries.

Iceberg Detector

Icebergs can be detected from the air by a radiation thermometer even though the surface of the ocean is hidden beneath a cloud or fog formations. The airborne thermometer, capable of measuring the sea surface temperature from an airplane, was developed at the Woods Hole Oceanographic Institution. It has been used to track the inshore edge of the Gulf Stream.

Electric Socks Keep Feet Warm

Cold feet are as old-fashioned as heavy blankets now that you can wear electric socks that operate like an electric blanket. Power for the socks is furnished by a six-volt battery worn on the belt. Wires run beneath the clothing to carry the current to warming wires woven into the toes of the socks, which are designed for hunters, ice fishermen and other winter-sports fans.

Altered Studebaker Coupe Becomes Fast Sport Car

Although he's a Studebaker dealer, Charlie Stuart of Indianapolis got his roadster the hard way—by cutting off the top of a new five-passenger coupe. After removing all the glass, a cut was made below the bead on the tops of the doors and down to the back of the seats in the rear. Door tops were covered with 12-gauge sheet metal, being leaded in for contour, and the windshield was lowered about four inches. Then the frame was boxed with $\frac{3}{8}$ -inch channel steel for added rigidity. The interior was covered with red leather upholstery and the body painted an oyster white. The V8 engine was ported and relieved with the heads being milled .090 of an inch. Dual manifold and exhausts make this combination give 160 horsepower. Speed of 120 miles per hour was achieved in a clocked road test.



What About Trailer Living?

Why have 2,000,000 Americans become trailerites? What kind of a life do trailer-dwellers lead? Is it comfortable? Expensive? Fun? Aren't trailer dwellers cramped for space? Are those 40-foot trailers hard to handle on the highway? You'll find the answers to these questions, along with some surprising information on America's trailerites, in "Trailers Are Stay-at-Homes Now" coming up with many other features in the December issue



Meter Tells Farmers When to Irrigate Crops

Irrigation farmers need not guess when their crops need water if they use a new moisture meter. The instrument is a plastic tube with a porous tip. With the tip buried in the ground, a dial indicates the moisture content of the soil. Usually a long tube is used to measure the moisture in the subsoil, while a shorter one indicates the water content near the surface.

Pen Prints Gold on Materials

Gold monograms, drawings and signatures are imprinted on virtually any material by a new electric pen set. The item to be decorated is placed on a slanting stand and a strip of gold paper placed over the area to be imprinted. After the pen has been warmed up a few seconds it is moved across the paper to imprint the monogram, signature or design on the item. A 600-inch roll of gold paper is included with the pen and stand, and additional rolls are available. The pen will imprint leather, cloth, paper, plastic, felt, wood, crockery and painted or varnished surfaces.



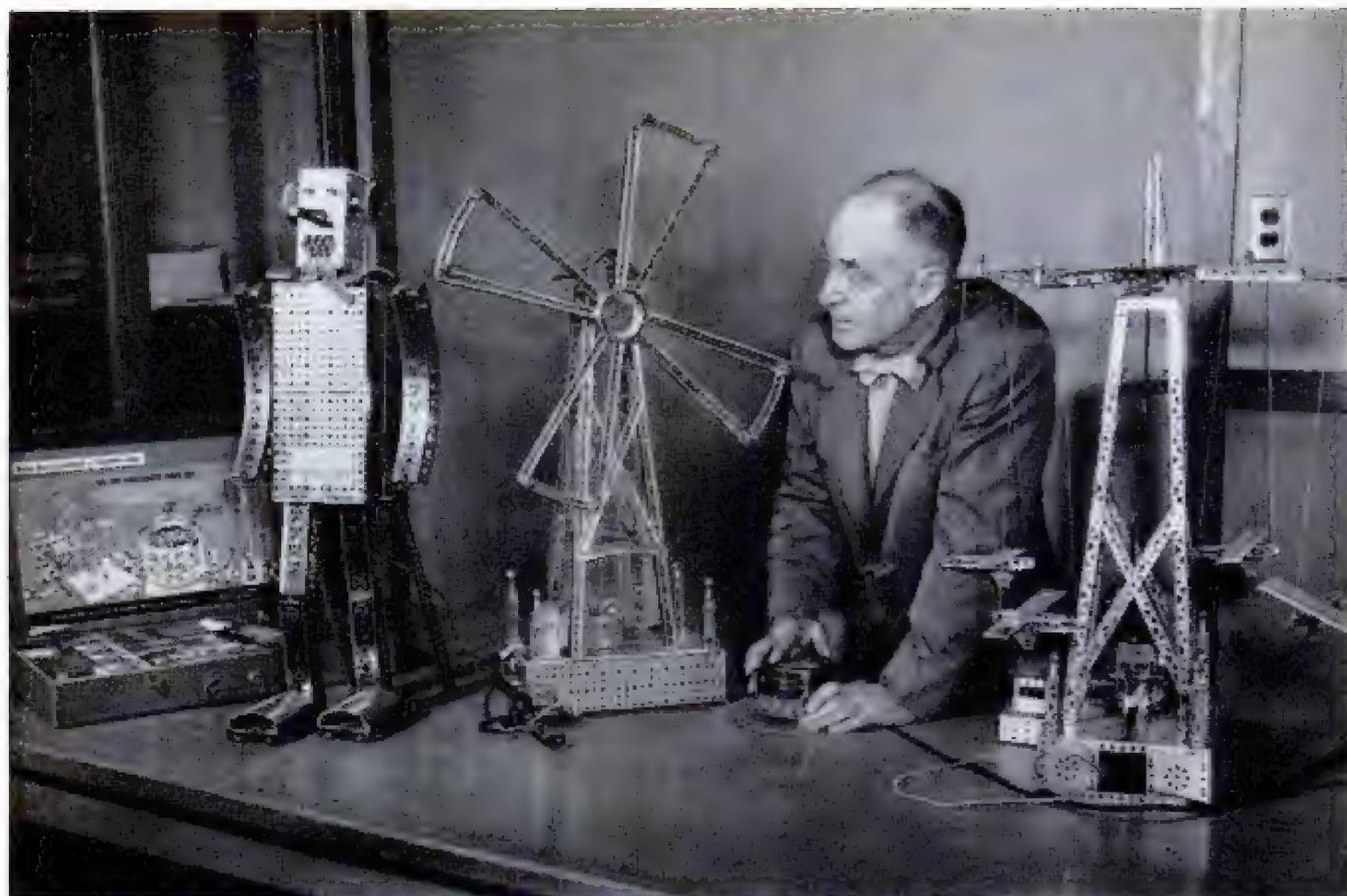
Britain Demonstrates "Sombrero" Flame Thrower

Dubbed the "ack-pack," Britain's new flame thrower has an odd-shaped fuel tank that looks like a Mexican sombrero strapped to the soldier's back. The weapon is shorter than most flame throwers of previous design. A length of flexible hose connects the fuel tank with the gun.

Spring Core for Wire Rope

Development of wire rope with a coiled steel-spring center is expected to solve a 50-year-old problem in deep oil and gas-well drilling. Wire rope has always been distorted and crushed by being wound layer upon layer around the huge drums of rotary rigs, under tensile loads of 50 tons or more. Some derricks use as much as 2800 feet of the rope which also has to be flexible enough to fasten around pulleys and blocks. The spring core principle developed by the Jones & Laughlin Steel Corporation resists crushing and gives firm internal support for the outer strands. Because of its hollow center, the new rope will hold more lubrication than previous types, reducing rust and friction wear.





A. C. Gilbert became a millionaire by scaling construction girders down to a size that children could handle

F O R T U N E S

in Toy Ideas

By Melvin H. Williams

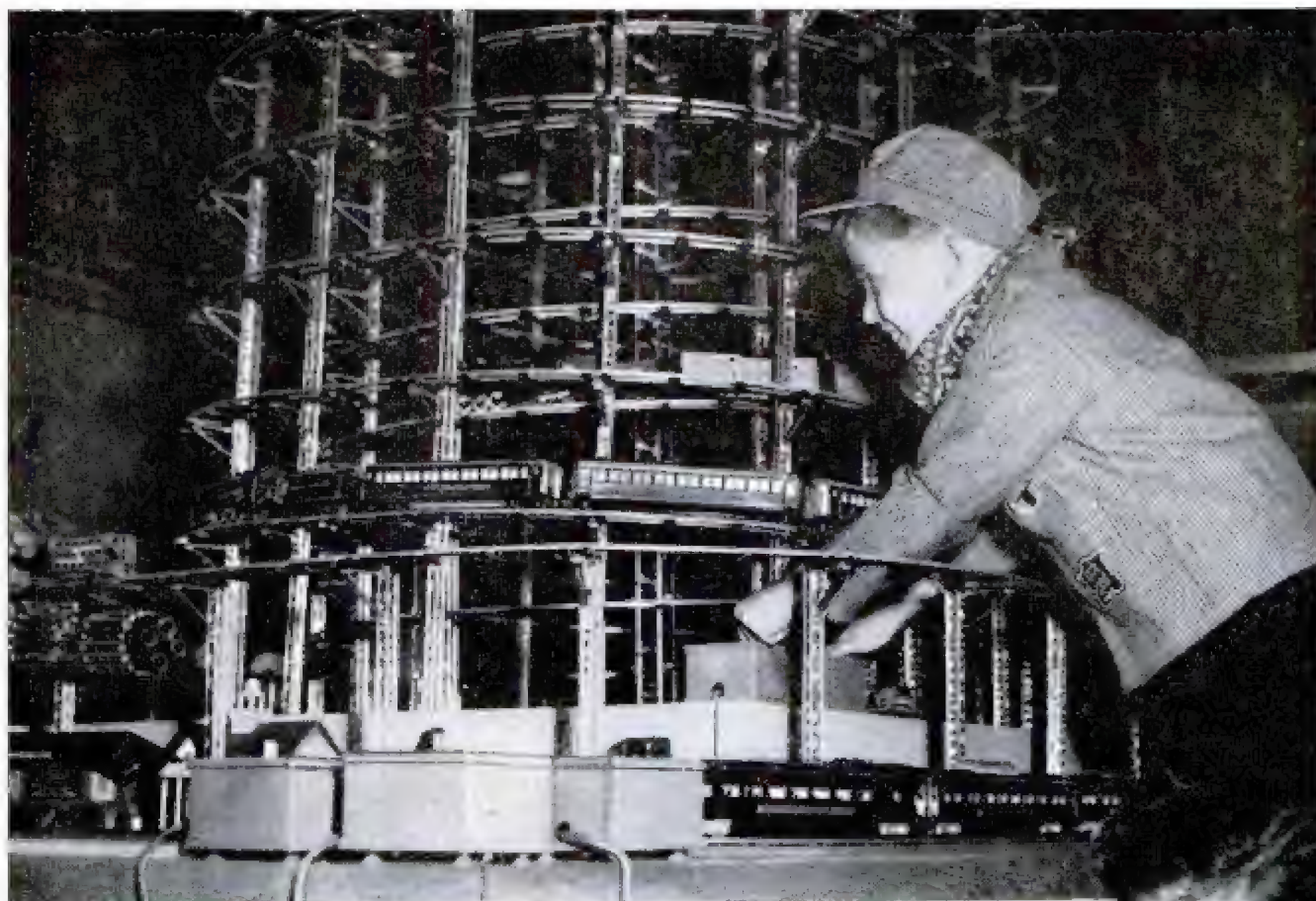


Sometimes two men hit on the same idea almost simultaneously. These plastic blocks fit together with snaps. Another firm makes a similar set from wood

WHERE DO TOY IDEAS come from?" Believe it or not, children usually invent the toy and parents perfect it. Housewives, office workers, teachers, hospital technicians, carpenters or businessmen are the toy designers of today. Some have made fortunes by developing good ideas they have found watching children "at work."

Almost anyone can come up with a new toy, as you'll see from the following examples. Each was successful in bringing fame and fortune to some person. Toys come and go like Christmas snows. Only one in a thousand becomes a best seller. But perhaps somewhere in these examples you can find the inspiration for a million-dollar idea of your own.

Some people spend a lifetime dreaming up new stunts to delight America's 45,000,000 children. In spite of this, there is a re-



Corkscrew turnpike built of Erector parts handles four separate trains at the same time

markable shortage of new toy ideas. The billion-dollar toy industry eats up good toys faster than professionals can turn them out.

Each inventor has his own system. Some work from the old toy catalogs or samples in museums. Old ideas are frequently good. When one generation of children grows up, another is ready for the same type of toy. Some toy inventors do not wait for new generations, but simply adapt yesterday's hits to today's demands.

Sometimes two or three inventors working independently on a similar idea find that, by collaborating, their parts fit together into a solid toy hit.

In 1949 Albert Weinstein, a professional inventor from Alexandria, Va., got an idea for a remote-controlled toy car. He steered it with an air-pressure bulb, but had no idea how to power it. So he contacted a friend, Louis Van Order of Verona, N. J., executive of a firm that made a tiny electric motor powered by flashlight batteries. Between them they designed Weinstein's auto so that it could be electrically operated by the flashlight-powered motor, controlled by a switch on the end of a wire. At that time the Aluminum Model Toy Company of Birmingham, Mich., was planning to make a plastic scale model of a new car. Frank McGinnis, an executive of the car manufacturer, brought the three parties together and the original remote-controlled car was born. The auto, which can back up, go forward, race in circles and be ma-



Father's doodles of future car inspired this new toy

neuvered into the most intricate spaces by an operator 10 feet away, was an immediate sensation.

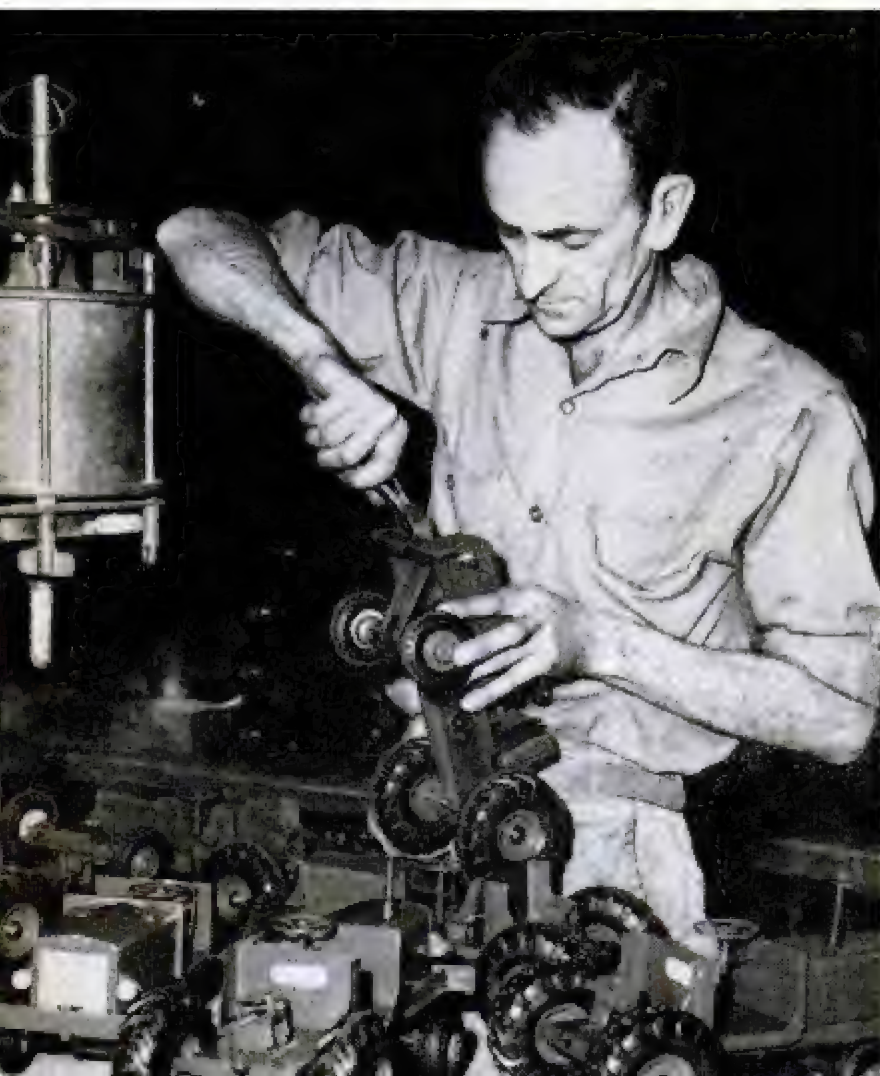
Designers often start something that just doesn't work out. If they're quick-thinking, they can turn their impractical "dream" into a profitable sale.

Elliot Handler, one of the country's most famous designers of children's music boxes, used to sketch ideas for "dream cars," just for fun. They were always far ahead of their time.

One day his 10-year-old son, Kenneth, found one of the drawings and asked his father to build him a streamlined car just like that. Flattered by his son's approval, Handler went ahead and built a toy car embodying his designs. The car was an instant hit with Kenneth and every other kid on



Eight years ago the Doepke brothers were repairing an old toy fire engine as a Christmas gift. Why not make better ones of steel? Today 270,000 trucks and machines roll out of their factory annually. Below, sturdy vehicles are exact copies



the block. So Handler, who was associated with Mattel, Inc., a Los Angeles toy firm, turned over his designs and model to the company. The firm is now producing 60,000 friction motor cars a day.

Most people in the toy business know they'll get good ideas if they study the simple things that children themselves invent to mimic adults.

For example, in late 1950 a toy manufacturer named Herman Kesler of the American Metal Specialties Corporation of Hatboro, Pa., was sitting in his kitchen lamenting the fact that another year would soon be upon him and he couldn't envision a single idea for a new toy. He watched idly as his children helped the maid with the dishwashing, using foaming suds, scouring pads, dish rack and a dish towel. Suddenly an idea clicked. From time immemorial, little girls have had tea dishes to play with and yet no one had ever given them their own dishwashing equipment. And what little girl doesn't like to play with sudsy water?

Thus was born one of the most popular girl's toys—the Doll-E-Do Dish, so obvious it defies inventiveness. It is simply a toy dishpan, dish-rack, sink strainer, apron and dish-mop, with real samples of brand name cleaning aids. Today, only a few years later, Kesler's firm has grossed over \$10,000,000 from just such simple ideas as this dishwashing kit.

A parent may invent a toy to meet the therapeutic needs of a sick child. It's strange but true that Vernon G. Eisel was literally forced to invent the Cradle Gym, one of the world's best-known infant toys.

In June, 1940, one of Eisel's twin infant daughters became paralyzed in her neck. Doctors agreed that manipulation of her neck muscles was necessary in order to strengthen them. To do it by hand was futile. The exercise had to be constant, which meant the infant would have to do it voluntarily.

Eisel had an idea. He threaded a lightweight steel chain through a rubber tube to which he attached two brightly colored handles and a cluster of tinkling bells. Then he strung the contraption across his daughter's crib. While he watched anxiously, she seized one of the colored handles. This caused the bells

to jingle and slowly her head turned toward the sound. The infant reached for another colored handle. Again a tinkle. Within 15 minutes she was straining her neck muscles actively in order to survey the whole gadget, and in less than two months the muscle damage had been repaired and the infant could turn her head normally. Eisel sold his device to a leading toy concern and just a few months ago received a check for his 100,000th royalty dollar. His Cradle Gym has now been used by more than 5,000,000 babies.

People who can't afford the real thing often design a new less expensive toy simply by improvising on the original. In March, 1952, John L. Joseph, a refrigerator-parts salesman, was watching his two preschool daughters fighting over some hollow wooden building blocks that had been given to them. There weren't enough to build their mutual houses, trains or boats. Joseph tried to buy more, but was astound-

ed to find they cost up to \$5 per block. He tried building suitable giant blocks out of wood. That was too expensive. He tried plastic. The cost of the dies ruled plastic out. For months he tinkered with the idea. All he wanted was a plain hollow block, no bigger than the cardboard carton his refrigerator parts came in. He jumped at the thought. Cardboard blocks. He took a heavy grade of corrugated kraft stock and finished it with a colored waxed surface. Then he reinforced the interior of each block with an egg-crate-type partition. This made the block so strong it would stand up under 500 pounds of dead weight. He could manufacture this block for a fraction of the cost of a wooden block, so he decided to become a toy manufacturer. His simple improvisation is a growing success and his firm is just completing its first year in the toy field with a handsome profit for its industrious founder.

Many successful toys are invented by utilizing some current news event or tying in a toy with a popular celebrity. Mickey Mouse, Howdy Doody and Hop-along Cassidy have made small fortunes for manufacturers of toys. But it is only the keen-eyed toy designer who catches the popularity on its upswing or gets

Back in 1902 a cartoon showing President Teddy Roosevelt and a bear cub inspired a toymaker to bring out a stuffed bear. Here's the first Teddy bear ever made, still popular with Roosevelt's great grandchildren





"Slinky" coil actually walked into someone's life. When an engineer was working with long springs, one of them was jarred loose and strutted down a pile of books. Buyers thought the idea crazy. Kids didn't



Some toys are less expensive adaptations of older toys. Big building blocks made of corrugated paper-board, reinforced with inner "egg crate," will hold 500 pounds. Below, "Why didn't I think of that?" Successful new toy is dishwashing equipment, sample size



the complete benefit of a celebrity tie-in.

On November 16, 1902, a newspaper cartoon appeared in *The Washington Post* showing President Theodore Roosevelt standing belligerently over a scrawny cub bear that had been dragged into his hunting camp by his guides. The cartoon became an immediate sensation. In Congress, in newspapers and in the street, people were discussing the incident of "Teddy's bear." To children, the term Teddy bear had a certain charm and they began asking for their own Teddy bear. To an enterprising New Yorker named Morris Michtom, this was the opportunity of a lifetime. He wrote to Roosevelt and asked the President for permission to use the name of "Teddy" on a line of toy stuffed bears. Roosevelt replied that he didn't know how much benefit his name would be in the toy business, but Michtom was welcome to use it.

In 1903, Michtom's first Teddy bear made its appearance and nearly 150 million of them have been made in the 50 years since then. By all estimates, it is the most popular toy in the world.

Plumbers, mechanics, carpenters and electricians may invent surprisingly successful toy tools just so their youngsters stay out of their own dangerous but intriguing tool kits.

Tom Grimes was in the basement workshop of his Chicago home in 1949 doing some needed repair work. His two-year-old son was also in the basement constantly reaching for a hammer, saw or screwdriver. As fast as Grimes retrieved one of the dangerous tools the boy would grab another. In desperation, Grimes made a small hammer out of a sanded piece of waste wood, drilled a hole in a board and let Junior bang round pieces of wood into the hole from one side and then from the other. The success of his idea delighted him as well as his son. The next day he made more tools out of wood. By week's end he had a whole workbench, accurate in scale, but complete with safe blunt wooden tools such as a hammer, screwdriver, wrench, vise and an assortment of wooden screws, nuts and bolts. Grimes took his idea to Playskool Manufacturing Company, educational toy firm, which tested his "workbench" in its clinics. The workbench, with a number of technical improvements, proved a big success in every test. Playskool has sold several hundred thousand of them in the past three years.

Every year, men looking for a profitable business to go into get ideas for toys and plunge in. When Fred Doepke came back from Army Air Corps service after World War II, he and his brother, Charles, an engineer, wanted a manufacturing busi-

(Continued to page 270)

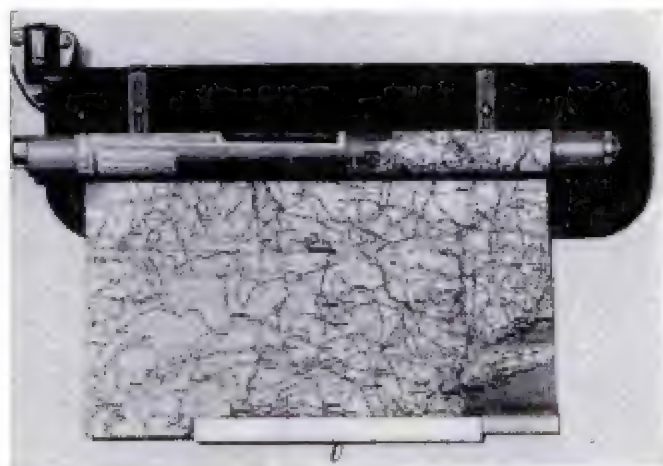


Northrop Aircraft Co. photo

Fighter Packs 104-Rocket "Sunday Punch" in Wing-Tip Pods

Wing-tip pod arsenals, packing a total of 104 lethal air-to-air rockets, now make the Scorpion F-89D the heaviest armed fighter. A hit with any one of the high-explosive missiles will destroy the biggest bomber. Radar in the 600-mile-per-hour-plus Scorpion guides it into attack position, where

an electronic brain takes over range calculations and the firing. With the rockets in the wing-tip pods, a little more than 50 feet apart, the F-89D lays down a barrage of rockets in twin patterns that saturate an area as large as a football field. The rockets can be fired in a single volley or in groups.

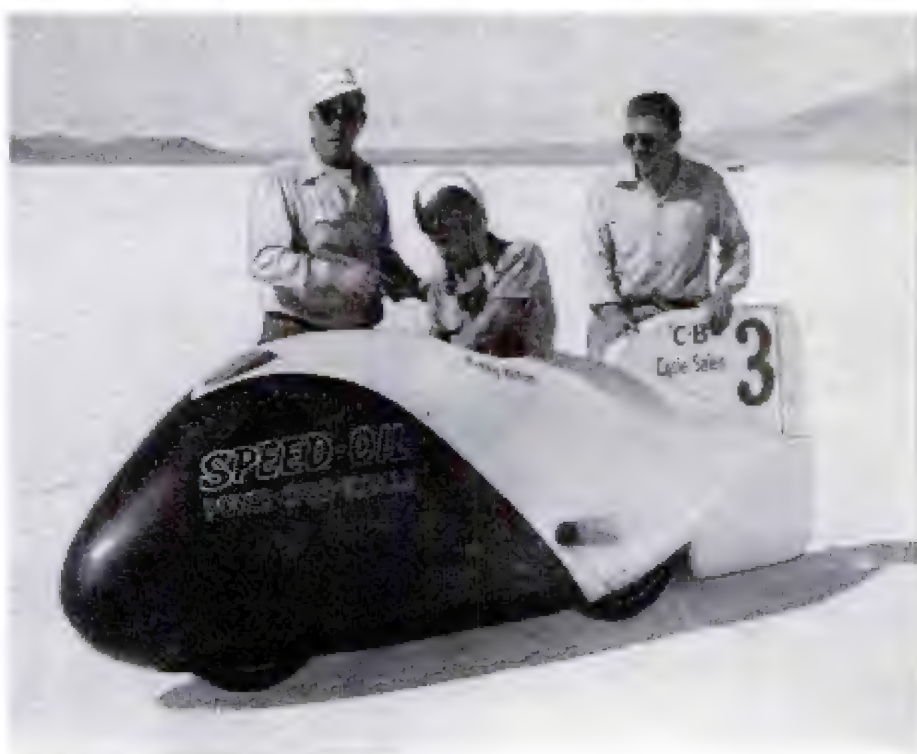


"Window Shade" Holder For Road Maps

Motorists now can pull down their road maps like window shades for easy reference. Standard maps are rolled into a new holder which is fastened to the car's sun visor. When the motorist wants to make a quick check of the map he unrolls it by pulling down on a metal plate. When he is finished, he gives the plate another tug and it rolls up neatly into the holder. The unit pivots to show reverse side. Metal clips grip the sun visor to hold the roller.

Streamlined Motorcycle Hits 170 Miles Per Hour on Salt Flats

Streamlined until it looks more like a porpoise than a racing machine, a competition motorcycle set a new United States record of 170.14 miles per hour on the Bonneville Salt Flats. Driven by Bobby Kelton, the cycle seemed to have plenty of reserve power, but it began to wobble and become airborne at that speed so he had to back off the throttle. The new mark is below the world's record of 180 miles per hour, set by a German. It is expected that an attempt to go 200 miles per hour will be made next year, using a redesigned shell and a battery-driven gyroscope.



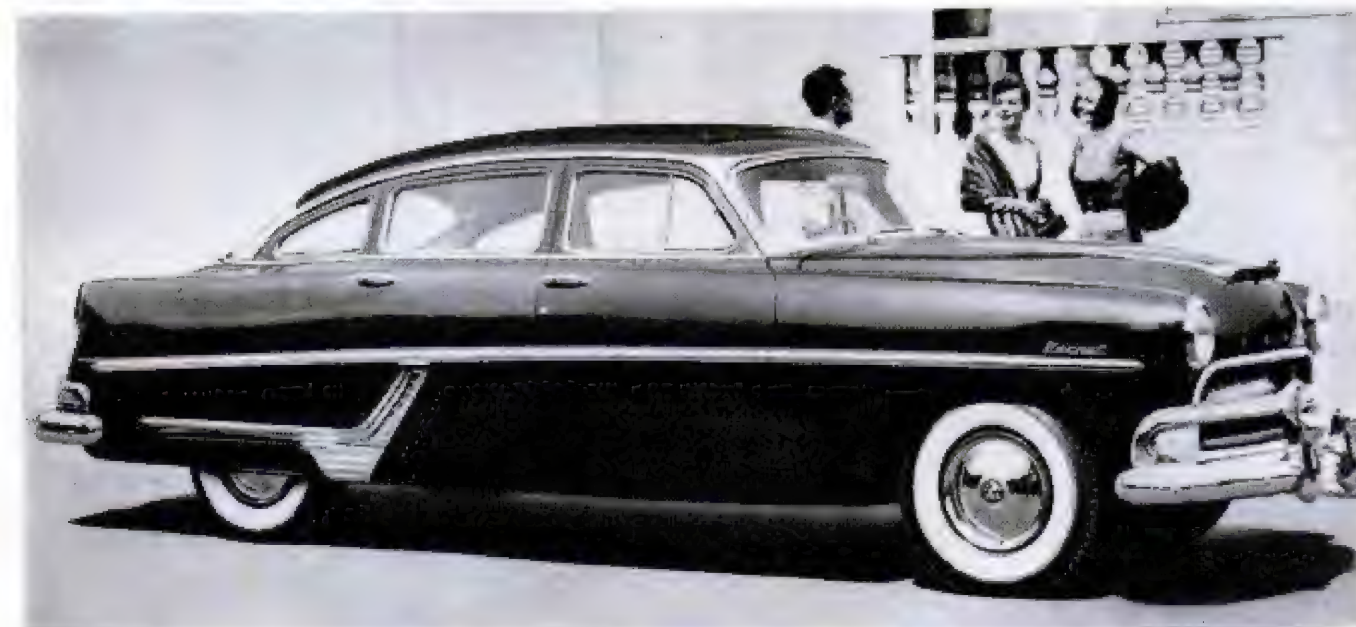


Dodge offers a luxury line, the Royal V8, of which the hardtop coupe is shown above. It has increased horsepower, a 7.5:1 compression ratio. All 1954 Dodge cars have newly designed trim, color-harmonized interiors



Slight trim changes distinguish the 1954 Jet from 1953 models. Inside are two extra inches of legroom in the rear. A two-door sedan (new this year) has a removable rear seat for conversion into a utility vehicle

Below, the 1954 Hudson has new fenders to make it look longer. The broader hood has a functional air scoop. Front grille styling is new also. Redesigned combustion chambers on all models give increased power





The '54 Car Parade Begins

LEADING the 1954 new-car parade are Plymouth, Dodge, Chrysler and Hudson.

Plymouth moved bumpers outward to increase over-all length. Chrome headlight rims and rear-fender trim emphasize the longer look. Added is the Belvedere line, a luxury series with two-tone exteriors.

Dodge offers the Red Ram V8 with 150 horsepower (up 10 from 1953), PowerFlite automatic transmission and power steering. Length is increased five inches. Grille and trim are new.

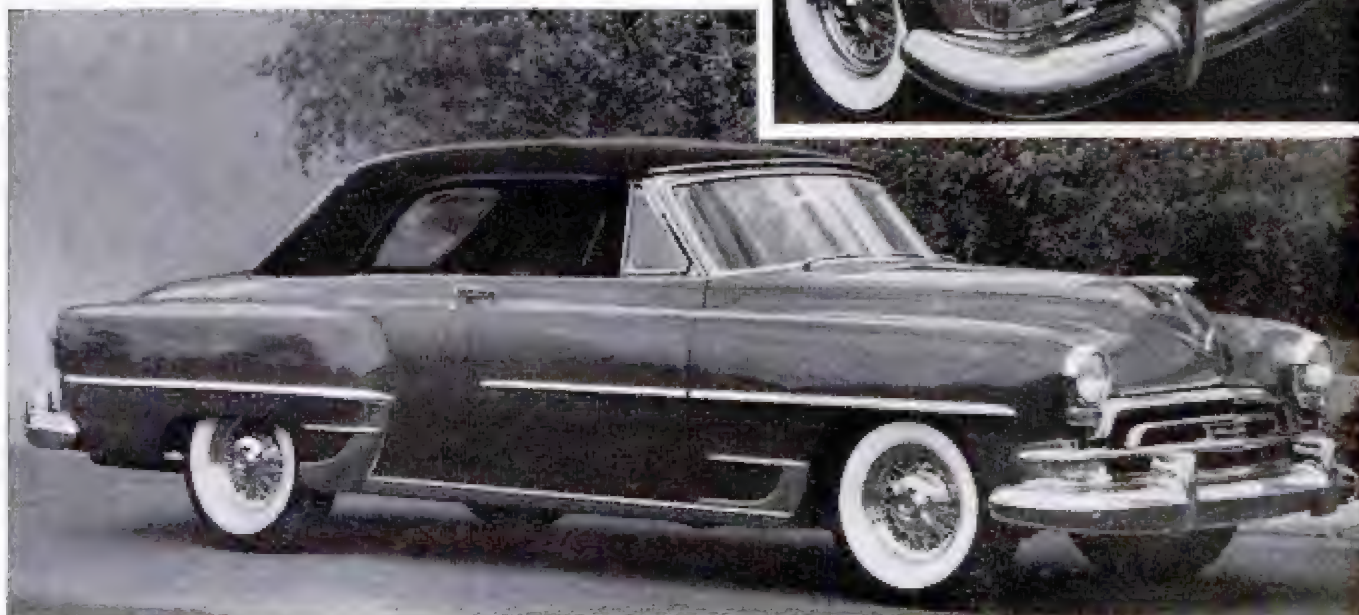
Chrysler leads the power race with its 235-horsepower V8 engine, upped from 180 by a four-barrel carburetor, new intake and exhaust systems. PowerFlite is standard on all V8 models, optional on the Windsor 6.

Hudson has a "squarer" look with longer rear fenders. All models have one-piece windshields. Horsepower is 160 on the Hornet (170 optional). Rear-seat legroom in the Jet is greater and a two-door sedan has been added.

Below, Chrysler New Yorker with most powerful engine in the industry. Right, new grille and headlight treatment



Top, Plymouth is several inches longer in '54. Shown here is the four-door Belvedere. Above, interiors are more colorful and luxurious. No-glare instrument panel is new safety feature



Detroit Listening Post



By Leo Donovan

THERE ARE economists who say the automobile industry can produce a lot more cars than it can sell—and they are talking about the immediate future. Automobile makers don't share their pessimism. They are confident they can sell what they build in 1954 and they don't plan production cutbacks. Nor do they plan any movement toward a basic, economy or stripped automobile.

Hudson, for instance, led the 1954 model introductions with a line of higher-powered cars, changed externally to resemble more closely the speedy **Jet** it had so much trouble getting into volume production last year. Its new, experimental car of Italian styling joins the trend toward special-run "sports" cars or "cars of the future." Graceful and with little ornamentation in the Italian manner, the car, named the **Italia**, bears little resemblance to current production models.

With a whopping 235-horsepower engine, the big **Chrysler** is aimed at a prosperity market. That's the \$7500-a-year-and-up income group which has doubled in size since the war.

This year, **Plymouth** has joined the movement toward a super-de luxe series in the low-price field. Last year, **Chevrolet** started it by announcing a complete **Bel Air** series—a lush line-up of body styles at premium prices. For 1954, **Plymouth** brought out the **Belvedere** series, which includes a hardtop coupe, a four-door sedan, convertible and station wagon. Advance stories from Dearborn indicate that **Ford** will do the same when it comes out.

Along the same line, the trend seems to be to the two-tone paint jobs. And, while the more conservative blues, greens and blacks still lead, the public is taking to brighter hues like ivory, cream and gold.

Dodge retains the wheelbases it had in 1953 and hopes to improve its position in the market with extensive "brightwork" changes and new, brilliant interiors. It also offers more horsepower and higher compression. With these changes **Dodge** hopes

to climb back into the 6th position in sales. Currently, it is 7th, behind the Big Three and **Buick**, **Pontiac** and **Oldsmobile**.

The 1954 **Ford**, top seller in its field in convertible, station wagon and hardtop lines, will have a host of mechanical improvements, featuring its long-awaited overhead-valve V8 engine. The present **Ford** V8 has served its maker well, having been in production since 1932. Of course, there have been refinements and modifications, but the basic engine is the same. The new model, however, is completely new. As the engineers say, "we started with a blank sheet of paper." Improved brakes and suspension are also rumored among the mechanical changes. There is also expected to be an addition to the hardtop line that will, **Ford** hopes, be the talk of the auto shows next spring. Still under wraps, it is a bold, new idea in body styling.

Mercury will go to the new overhead-valve V8 when **Ford** does. The new engine will mean more power and a more sprightly performance. **Lincoln** is expected to rest on its laurels, having won the first four places in the 1952 Mexican Road Race with its 205-horsepower engine.

The disastrous fire that destroyed General Motors' \$40,000,000 Hydra-Matic plant has caused widespread dislocation in the industry. **Cadillac**, **Oldsmobile** and **Pontiac** production was cut back until changes could be made.

Cadillac, in short supply all year, made a quick switch to Dynaflow, the **Buick** automatic transmission. Only 27 days after the fire, the first Dynaflow-equipped **Cadillac** came off the assembly line. Automatic transmissions are a must with **Cadillac**; it uses them on 100 percent of its production.

Oldsmobile (with Hydra-Matic on 98.5 percent of its production) also turned to Dynaflow. Production plans call for 43 percent Dynaflow and 57 percent conventional hand-shift transmissions through the 1953 model year.

Pontiac (85 percent Hydra-Matic) is equipping its cars with Powerglide, borrowed from **Chevrolet**.

Independent **Hudson** (which installs Hydra-Matic on more than 50 percent of its cars) was hard hit because it is already in the midst of its 1954-model production. **Lincoln** installs Hydra-Matic on all its cars and is, at this writing, studying a switch to a transmission adapted from Merc-O-Matic.

Other independents, like **Nash** and **Kaiser**, that use Hydra-Matic apparently had enough in stock to keep them going.

General Motors claims that the fire will not delay the introduction of its new models. At this writing, it expects to be back in Hydra-Matic production at about the time this appears (late in October). The GM



Ten inches lower than a standard Hudson, the Italia has a wrap-around windshield to give full forward vision

Hudson and Packard Present Their "Cars of the Future"

Showing "cars of the future" is popular with car manufacturers today as they sound out public tastes. This year, Hudson and Packard brought out their versions.

The Hudson Italia was built on a Jet chassis in Italy. The Packard Balboa, an American product, features a canopied rear window. Neither is planned for mass production.

Under the rear canopy, the Packard Balboa's rear window opens for ventilation and remains clear in a storm



line will come out beginning in December.

The smaller GM cars are not expected to have major changes, although the rumor persists that **Chevrolet** may switch to a V8 engine in midseason next year. The same rumor crops up frequently about **Plymouth** (as does the story about a V6), but until sales become much slower than at present it is unlikely to occur in midseason.

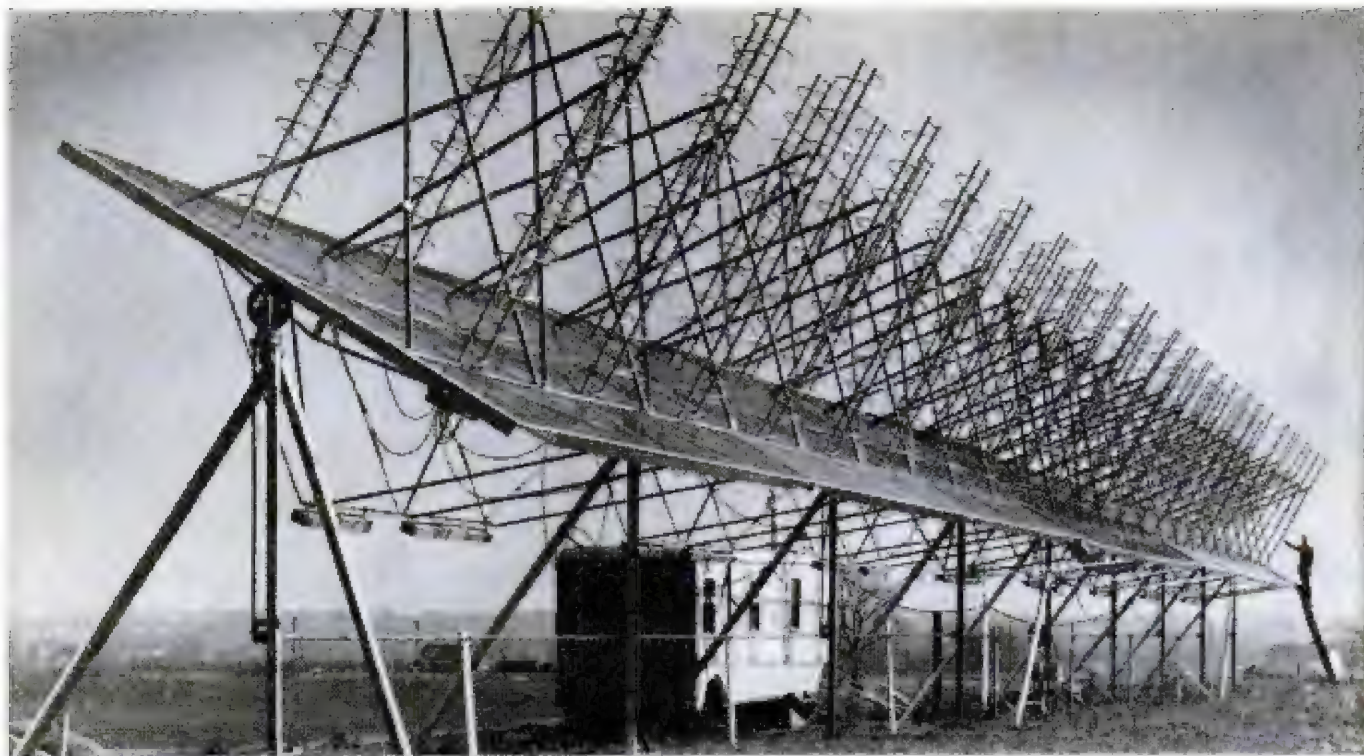
Major body changes are expected to be made in the **Cadillac**, big **Buick** and **Oldsmobile** lines—rumor says the most extensive in the whole industry for 1954. The wrap-around windshield, scheduled for these cars, is expected to become standard design in most makes within a few years. Also expected are extended rear fenders.

Packard is going to take top honors in compression ratios, if stories now circulating are true. Engineering circles are speculating that the new **Packard** engine for 1954

will have a compression ratio of 9.0:1.

Studebaker, with its 1953 line being the most radical in history, is not expected to make major changes in 1954. There is some evidence that it will, for the first time, bring out a station-wagon body.

Evidence of the effective means auto makers have of checking on their competition was noted at the **Ford** proving ground early in September. At that time there were only a handful of **Chevrolet Corvettes** (the plastic roadster) off the assembly line and all were supposedly in the hands of GM big shots and friends. The press showing of the **Corvette** production models was scheduled for September 28th—then still two weeks away. Visitors at **Ford** spotted a shiny **Corvette** speeding around the test track trailing a fifth wheel and loaded down with test instruments as **Ford** engineers gave the sleek car the once-over. ★ ★ ★



Corkscrew antennas mounted on pivoting frame trap radio waves from outer space. Trailer houses receiver

Star Hunting by Radio

By William F. Rounds, Jr.

THERE'S AN EASIER LIFE ahead for some astronomers, thanks to a new "push button" approach to stargazing.

In radio astronomy, the infant but rapidly growing branch of the ancient science, there need be no freezing nights in an unheated observatory, no waiting for skies to clear, no tedious hours spent in photographing infinitesimal pin points of light. Automatic installations, like Ohio State University's Radio Observatory, permit star hunting on "bankers' hours."

From a cornfield on the university farms, the nation's largest radio telescope systematically scans the heavens on a 24-hour schedule. Unattended for all but a few minutes a day, the giant antenna array is seeking sources of radio waves in outer space, trapping energy emitted by stars or nebulae thousands and millions of years ago.

Each day the telescope sweeps a small segment of the sky. The hissing, staticlike signals from the radio stars it encounters are put on paper by an automatic recorder.

Once a day a worker visits the observatory site to pick up a six-foot strip of paper tape. This contains, in a jagged, continuous line, the tangible results of the previous day's observations. Back in a campus laboratory, the peaks and valleys of the record are studied and interpreted. When a peak signal occurs from an apparently unoccupied portion of space, the radio astronomers note the location. If the signal is confirmed

by three succeeding days' observation they can write into the record a new heavenly body, perhaps a vast, invisible nebula millions of light years away.

By this method the scientists have doubled the number of recorded radio stars in a sky survey that began last February. Before, there were some 200 known stellar sources of radio waves.

Mass-production star finding takes a highly specialized and complex instrument. The observatory's equipment, valued at \$100,000, took a year and a half to build. The telescope has a 160-foot framework which supports 48 helical antennas. Their corkscrew design was originated by Dr. John D. Kraus, who supervised the construction and now directs operation. The unique array, one of the world's largest, serves as a telescope because it picks up radio emissions from space just as an optical instrument collects light. The telescope's framework pivots so that the angle of its beam above the horizon can be varied. The beam, less than a degree wide, is swept across the sky by the turning of the earth.

Engineers estimate that Ohio State's equipment is about a million times more sensitive than the average TV receiver. Some of the signals it picks up, Dr. Kraus reports, have the strength of a millionth of a millionth of a millionth of a watt per square yard of antenna surface. A large antenna and a delicate

receiver are necessary to catch such minute amounts of power.

From the antenna, the star signals are fed by coaxial cables into a four-stage radio-frequency preamplifier, then to an ultra-high-frequency superheterodyne receiver with five intermediate frequency-amplifier stages. At this point, the signal is converted to direct current and sent through five more amplifier stages before it finally activates the recording pen.

Tuning the receiver, incidentally, is a five-hour job. Receiver and recorder are housed in a trailer at the observatory site. Here also is a separate receiver which superimposes time signals on the star emissions. Precise timing is an important factor in locating the source of the waves.

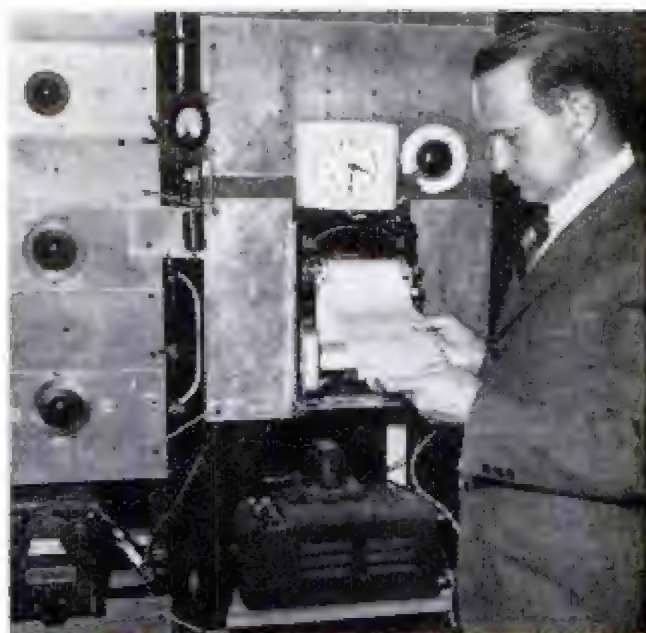
University astronomers say the telescope's size, design and sensitivity give it the ability to ferret out stars never before recorded in the 21 years since Karl G. Jansky first discovered radio waves coming from space. Completed in the summer of 1952, the telescope first ran a trial sky survey.

Many of the celestial wave emitters found in the present survey are what Dr. Kraus calls "extended sources." While the sun covers about one half a degree in space, these sources, at much greater distances, reach across several degrees and must be fantastically large. Some of the newly found sources have been identified as galaxies, or island universes, at distances of millions of light years from the earth. Others are known to be great clusters of such galaxies.

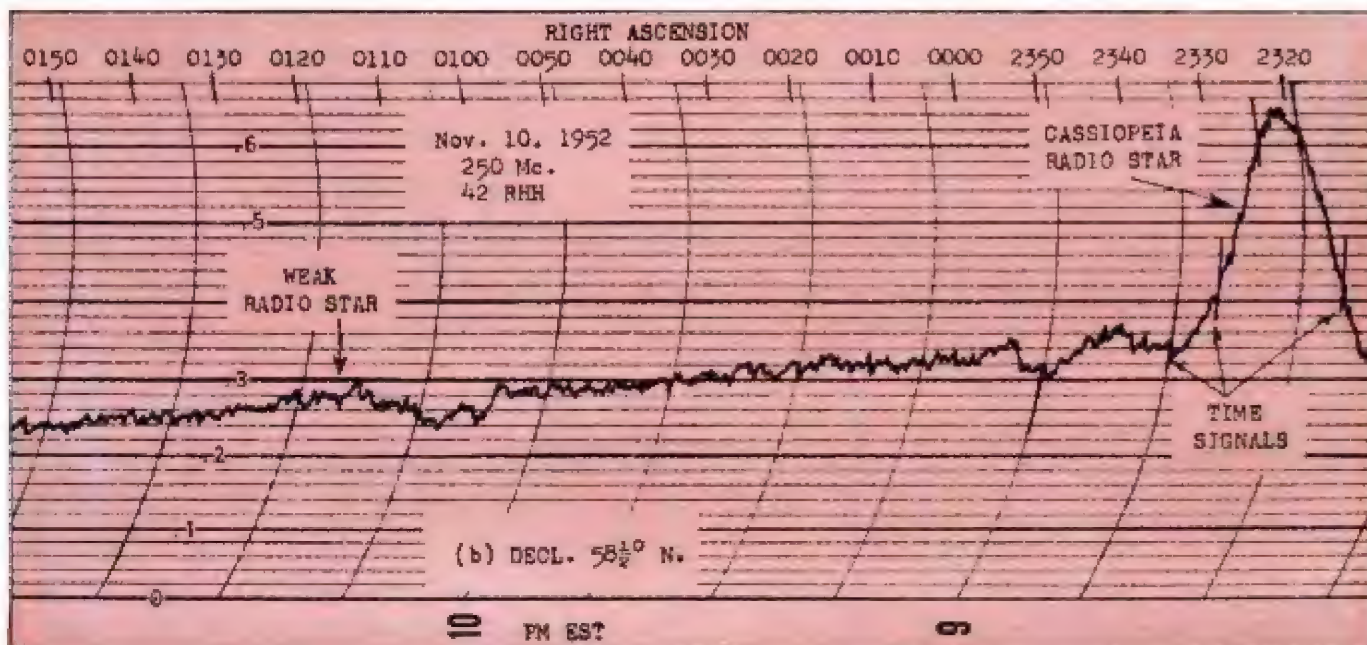
But perplexing questions remain. Why does one nebula emit intense waves, while another does not? Why do the strongest radio stars often give the least light? Is radio energy created by actual stars, or by the interaction of swirling, tenuous gases? The push-button telescope may provide a basis for answers. ★ ★ ★



Declination of the telescope can be varied manually as shown here, or by motor controlled from trailer



Observatory director Kraus studies star signals as they unroll from automatic recorder. At left is receiver panel. Below, graph recording of star signals. Jagged line shows waves emitted by a weak radio star and by strongest radio star yet found





Air Research and Development Command photos
Swept-wing F-84 "parasite" shown just prior to making contact with retrieving mechanism beneath a B-36

B-36's Fly Combat Planes to and From "Work"

Very little of the fighter protrudes from giant bomber's belly

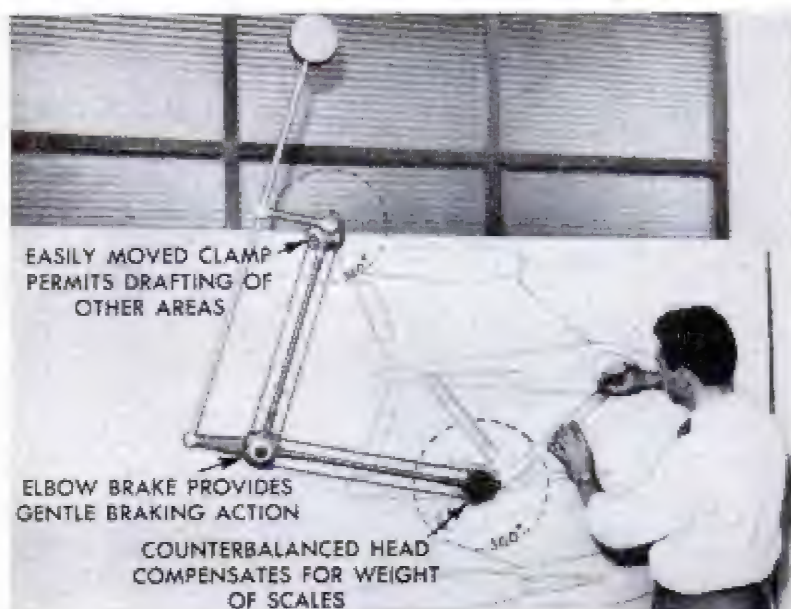


For the first time the U. S. Air Force is flying full-size combat airplanes from "mother" B-36s. A new retrieving mechanism permits Republic F-84s used in the tests to make in-flight landings as well as to be released in the air. This lift gives the carried aircraft the capability for long-range, high-speed reconnaissance. Research aircraft such as the Bell X-1 have been launched from B-29s but are unable to return. A small experimental "parasite" aircraft, was used during tests that led up to carrying the F-84.

Vertical Drafting Machine Is Counterbalanced for Ease of Operation

Less tiresome to use because it lessens stretching, a vertical drafting machine has a brake to steady it in any position. In addition, the vertical mounting permits work on larger drawings and takes up less space than conventional equipment. It can be used with 12-inch vertical and 18-inch horizontal scales. The heads are counterbalanced to compensate for the weight of the scales.

Information not listed on articles in the index often is listed in the WHERE-TO-FIND-IT LIST, available at no cost from the Bureau of Information, *Popular Mechanics*, 200 E. Ontario, Chicago 11





Kodak Chevron, above and top left, features precision split-beam range finder and a thumb lever that permits turning film to next frame without lowering camera. Twelve 2¼-inch-square exposures are taken on each roll of 620 film. Fast, accurate shutter operates at 10 speeds from 1 to 1/800 second

Three Color Cameras Insure Shooting Ease

Like other two models, Brownie Holiday camera, left, is especially designed for taking color pictures. Made for the casual snapshooter, camera has loading instructions on case



Lens-coupled range finder of Kodak Bantam RF camera, right, is similar to that of more-expensive Chevron. Equipment includes leather field case and flash holder. Shutter operates from 1/25 to 1/300 second, is synchronized for flash lamps at all speeds except 1/300 of a second. Camera has an automatic film stop and double-exposure prevention, with a release for intentional double exposure. Settings for bright, hazy and average conditions for black-and-white and color film are marked on camera as a guide for the amateur snapshooter



The OWNERS

1. I own a 1953 Nash: Rambler ☐ Statesman ☒
2. It has conventional transmission ☐ Overdrive ☒
3. Speedometer reading now is 4768 miles.
4. I use regular ☒ or premium (high-test) ☐ gasoline.
5. My average gasoline mileage in city: 22 m.p.g.; in country: 27 m.p.g.
6. I add No quarts of oil in 1000 miles. I change oil every 1000 miles approximately.
7. Here is what I like best about my Nash. It is economical, drives good, handles good, and looks good!
8. Here are my specific complaints: Turning radius is only thing I don't particularly like although for most operating conditions that is also satisfactory

PARIS, TEX., OIL
REFINERY BOSS &
STATESMAN OWNER

BIGGEST COMPLAINT OF NASH OWNERS

SOME
OWNERS
WANT
BETTER
BRAKES

9. I rate its roadability*: Excellent ☐ Good ☒ Unsatisfactory ☐
10. I rate its handling*: Excellent ☐ Good ☒ Unsatisfactory ☐
11. I rate its structural rigidity*: Excellent ☐ Good ☒ Unsatisfactory ☐

*For an explanation of these terms see reverse side of this sheet.

12. Acceleration from a standstill: Excellent ☐ Good ☒ Unsatisfactory ☐
- Acceleration from 50 miles per hour: Excellent ☐ Good ☐ Unsatisfactory ☒
13. I have tried Nash power steering and find it worth the extra cost ☐
- Not worth the extra cost ☐ Explain _____

14. I would ☐ or would not ☐ like power braking in this car. Explain Brakes could be improved
15. I would ☐ or would not ☒ prefer a V8 engine in this car. Explain Would like at least 20 more H.P.

16. My ratings of these specific features:

Visibility, forward	Like <input checked="" type="checkbox"/>	Acceptable <input type="checkbox"/>	Dislike <input type="checkbox"/>
Visibility, rear	Like <input checked="" type="checkbox"/>	Acceptable <input type="checkbox"/>	Dislike <input type="checkbox"/>
Riding comfort	Like <input checked="" type="checkbox"/>	Acceptable <input type="checkbox"/>	Dislike <input type="checkbox"/>
Horsepower output	Like <input type="checkbox"/>	Acceptable <input type="checkbox"/>	Dislike <input checked="" type="checkbox"/>
Exterior body styling	Like <input checked="" type="checkbox"/>	Acceptable <input type="checkbox"/>	Dislike <input type="checkbox"/>
Interior body styling	Like <input type="checkbox"/>	Acceptable <input type="checkbox"/>	Dislike <input checked="" type="checkbox"/>
Reclining front seat	Like <input checked="" type="checkbox"/>	Acceptable <input type="checkbox"/>	Dislike <input type="checkbox"/>
Bed-in-a-car feature	Like <input checked="" type="checkbox"/>	Acceptable <input type="checkbox"/>	Dislike <input type="checkbox"/>

Not enough
for Ambassador
Too scratchy

OAK RIDGE, TENN.,
RESTAURATEUR &
AMBASSADOR OWNER

TWO POPULAR REASONS FOR BUYING A RAMBLER

17. My Nash is too big ☐ Too small ☐ just right ☒ Comment Waking man's cat.
18. I have ☒ or have not ☐ owned a Nash before. (How many? two)
19. I bought this Nash because newer styling - overdrive for economy
20. I would buy another Nash ☒ would not ☐ might ☐ Average ☐ Poor ☐
21. Over-all, I rate my Nash: Excellent ☐ Good ☒

CINCINNATI, OHIO,
AUTO MECHANIC &
RAMBLER OWNER

Only complaint is small turning radius. Car will not turn in a satisfactory circle - very confusing when parking - especially in a lot.



REPORT on the NASH

By Floyd Clymer

The true test of a car begins when the owner takes the wheel. *Popular Mechanics* sent questionnaires to 1000 Nash owners. Here's what they say about their cars

NASH OWNERS form a diversified group. Some drive big cars, some drive small cars and some drive medium-size cars.

There's the Ambassador—a 209-inch-long car, almost as roomy as a bus. Or the Rambler—185 inches of compact automobile on a 100-inch wheelbase. Between these two is the 202-inch-long Statesman.

Nash has variety in engines, too, offering 85, 90, 100, 120 and 140 horsepower. Car weights in the Nash line range from 2570 pounds for a Rambler to 3550 pounds for an Ambassador.

There is agreement on one point—all Nash owners seem to agree that their cars are economical to operate. Sixty-six percent of the Rambler owners responding listed economy as the feature they like best. Of the Statesman owners, 44 percent gave economy, and 41 percent of the owners of the Ambassador agreed that economy was a most-liked feature.

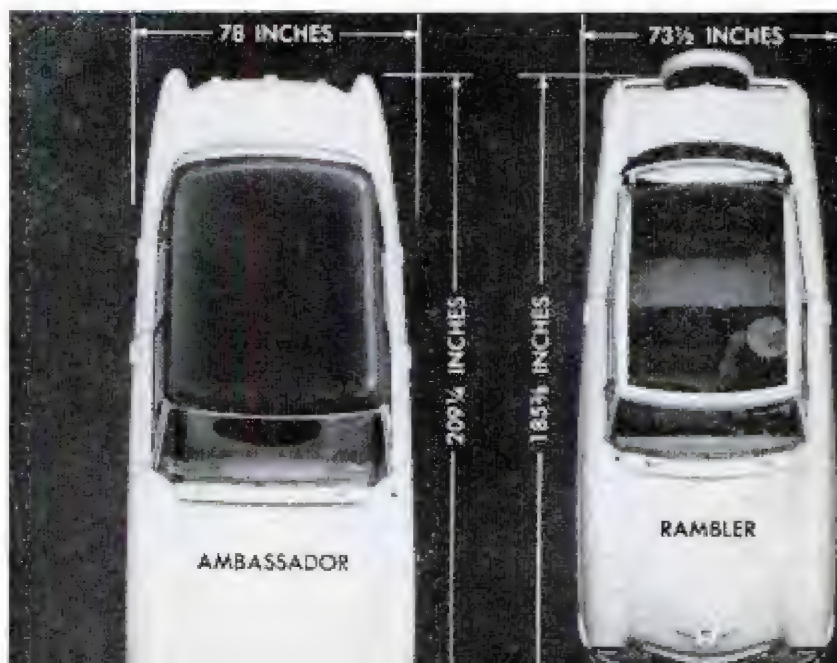
Here are the figures on gasoline economy as taken from the Owners Poll:

Rambler owners average 22.0 miles per gallon in the city, 26.1 in the country; Statesman owners average 17.6 in the city, 21.3 in the country; Ambassador owners average 16.1 in the city, 19.7 in the country. Oil consumption was almost zero, according to the owners.

Nash drivers also agreed on a common complaint—the large turn-circle diameter. Owners of all three models gave it as the least-liked characteristic.



Clymer's favorite test hill presented no problem to the Rambler. It topped the crest at 26 miles per hour, faster than many larger and more powerful cars have done it. Below, Nash offers buyers a range of sizes. Here are the biggest and smallest in the family



After a total of over 1,500,000 test miles, owners in 20 states tell how they like Nash

Percentages from PM Poll of Nash Owners

Acceleration from standstill	Rambler	Statesman	Ambassador
excellent	42%	30%	49%
good	48%	67%	48%
unsatisfactory ...	0%	3%	3%
Acceleration from 50 m.p.h.			
excellent	50%	34%	52%
good	50%	61%	42%
unsatisfactory ...	0%	5%	6%
Would buy another Nash?			
yes	78%	77%	78%
might	22%	21%	20%
no	0%	2%	2%

Over-all rating of Nash			
excellent	67%	62%	63%
good	33%	30%	32%
average	0%	7%	3%
poor	0%	1%	2%

ALL NASH OWNERS REPORTING

Use regular gasoline.....	63%
premium gasoline.....	37%
Previous Nash owners.....	69%
Owners of five or more Nash cars previously.....	13%

Ratings on particular features

	Like	Acceptable	Dislike
Visibility, forward.....	98%	1%	1%
Riding comfort.....	97%	2%	1%
Visibility, rear.....	97%	2%	1%
Reclining front seat.....	93%	5%	2%
Interior body styling.....	88%	12%	0%
Exterior body styling.....	87%	11%	2%
Bed-in-a-car feature.....	87%	11%	2%
Horsepower output.....	60%	35%	5%

Chief purchase reasons

(in order of frequency)

1. Previous satisfactory Nash ownership
2. Styling features
3. Economy of operation
4. Trade-in allowance
5. Driving and handling qualities
6. Engine and performance

NASH OWNERS BY MODELS

Average miles per gallon	Rambler	Statesman	Ambassador
city	22.0	17.6	16.1
country	26.1	21.3	19.7
Roadability			
excellent	54%	64%	78%
good	42%	35%	20%
unsatisfactory ...	4%	1%	2%
Handling			
excellent	71%	65%	66%
good	29%	33%	32%
unsatisfactory ...	0%	2%	2%
Structural rigidity			
excellent	75%	74%	64%
good	25%	22%	32%
unsatisfactory ...	0%	4%	4%

Best-liked features of Rambler

Economy	66%
Ease of handling, parking, etc.....	25%
Exterior styling.....	17%
Comfortable ride.....	17%
Reclining seats.....	13%

Best-liked features of Statesman

Economy	44%
Ease of handling.....	36%
Exterior styling.....	32%
Comfortable ride.....	30%
Roominess	30%

Best-liked features of Ambassador

Comfortable ride.....	45%
Economy	41%
Ease of handling.....	28%
Roominess	22%
Visibility	22%

Most frequent complaints of Rambler owners

Large turning radius.....	38%
Visibility to rear.....	13%
Brakes fade.....	10%

Most frequent complaints of Statesman owners

Large turning radius.....	25%
Water and dust leaks in body.....	10%
Lack of power.....	10%
Poor chrome.....	7%
Poor dealer service.....	7%

Most frequent complaints of Ambassador owners

Large turning radius.....	19%
Water and dust leaks.....	17%
Doors hard to operate, noisy.....	9%
Poor paint and chrome.....	9%
Poor dealer service.....	7%

Nash owners with no complaints at all

Rambler owners.....	29%
Statesman owners.....	22%
Ambassador owners.....	26%

The skirted front wheels are responsible for this weakness which means U-turns are almost impossible on average streets and maneuvering into parking spaces and garages is difficult.

While only a few actually complained about it, not many were enthusiastic about Nash acceleration, especially among Statesman owners.

Rambler Comments

These are some of the comments from Rambler owners:

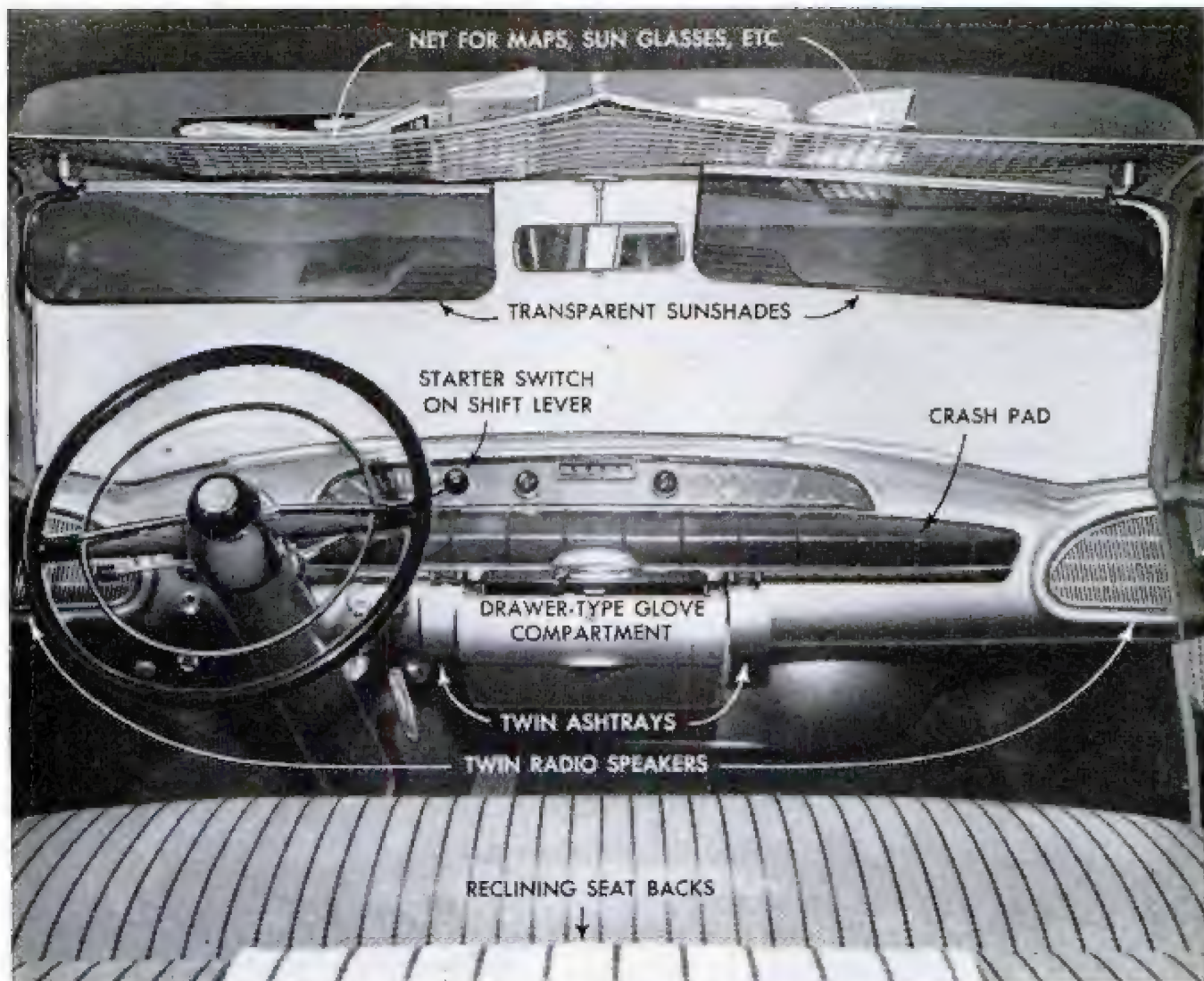
"I read electric meters in the country and make about 250 stops a day. With this

type of driving I get 19 miles per gallon."—Menomonee Falls, Wis., meter reader.

"My gas mileage is 25-26 miles in town. On my 2600-mile trip through the South I bought 90 gallons of gas, averaging just short of 30 miles per gallon."—Miamisburg, Ohio, plant superintendent.

The smallness of the Rambler was another favorite point with the owners, 25 percent listing the ease of parking and handling as features they liked best.

"My wife finds our Rambler station wagon very easy to drive and park. It is also fine for family pleasure driving (I have



Ambassador interiors have features not found in other cars. Reclining seats are a favorite with the owners

three small children)." — E. Weymouth, Mass., electrician.

"Very easy to handle, especially parking." — Sandusky, Ohio, telephone operator.

Farina's new Rambler styling was mentioned by 17 percent of the owners.

"We are very proud and satisfied with our Rambler station wagon, which is beautiful." — Delaware, Ohio, housewife.

"I liked the improved visibility accomplished by lowering the hood and raising the fenders so that both are visible to driver at all times." — Oak Park, Ill., clerk.

"This is my first Nash. It is the first Rambler designed to attract people like myself. I never liked the looks of older models (too much hood)." — Woodstock, Ill., railroad worker.

The Rambler's comfortable ride and the luxury of reclining front seats were also favorites with owners in the poll.

But the body styling has disadvantages, say the owners.

"I like the body lines, but if the car could be turned at sharper angles when U-turning or parking I believe this would be an improvement." — Ripon, Wis., student, referring to the front-wheel skirts that give the Rambler a large turn-circle diameter.

"The 42-foot turn circle of my Rambler makes it harder to park than most larger cars." — Arlington Heights, Ill., housewife.

Of the Rambler owners reporting, 38 percent listed this inability to turn sharply as a complaint.

"Rear window is hard to see out of using the rear-view mirror." — Marion, Ohio, printer. Thirteen percent complained of poor vision to the rear.

"Poor brakes. Not enough braking surface. My complaint with all eight of my Nash cars is brakes." — Newark, Ohio, technician—10 percent agreed with him.

"I purchased a Rambler station wagon and found that with my family of four children this is an ideal car for going on trips and outings. Space in rear can be used as a bed. Easy to clean and rearrange as a pleasure car." — Akron, Ohio, foreman.

"Unit-weld body and frame [means] no rattles." — Willoughby, Ohio, technician.

There was a scattering of complaints by Rambler owners on the lack of legroom in the rear seat, water leaks in body, awkward position of the gear-shift lever and poor location of dimmer switch. However, 29 percent of the Rambler owners wrote "None" when asked to list complaints.

ACCELERATION TEST

1953 NASH RAMBLER
Hardtop Convertible with Overdrive

¼ mile from zero	21.1 sec.
½ mile from zero	28.9 sec.
0 to 30 m.p.h.	5.3 sec.
0 to 60 m.p.h.	18.9 sec.

Top speed by speedometer.....91-93 m.p.h.
Actual top speed about 7% less (speedometer variation)

ECONOMY TEST

MILES PER GALLON
Constant-Speed Mileage

	Overdrive	Conventional
At constant 30 m.p.h.	30.1	29.6
At constant 50 m.p.h.	27.2	24.5
At constant 60 m.p.h.	22.1	20.4
At constant 75 m.p.h.	20.2	17.9

Cross-Country Mileage

Los Angeles to Fresno, Calif.	22.4 m.p.g.
Fresno to Boise, Idaho (some mountains)	21.2 m.p.g.
Boise to Reno, Nev. (via Sun Valley)	22.9 m.p.g.
Reno to Los Angeles	23.1 m.p.g.

Regular gasoline was used over entire 2181 miles

Only four percent of the Rambler owners described the car as too small. None rated acceleration as unsatisfactory and 67 percent rated their Ramblers as excellent over-all.

Statesman Comments

Like Rambler owners, the owners of Nash Statesman models rated economy tops.

"It is a poor man's car with a rich man's luxury."—Rochester, N. Y., foreman.

"I kept track of every drop of gas I bought and am getting 19.6 miles per gallon on all my driving. On trips I get over 24 miles per gallon."—Algoma, Wis., welder.

Of course, there are those who disagree.

"I think Nash should forget about economy in the Statesman and Ambassador and build a faster, more powerful car."—Lancaster, Tex., office worker.

Handling ease was second most popular with Statesman owners.

"Ease of handling on curves and in wind. Perfect balance under all conditions plus comfort unsurpassed by any car."—San Bernardino, Calif., retired owner.

About a third of the Statesman owners were most pleased with the Farina styling, as was an Ohio highway patrolman who wrote, "Has most modern design."

Two other oft-mentioned features are comfort and roominess.

"Comfortable sitting—spacious, adjustable seats. Economy of fuel and beauty of body lines."—Eugene, Ore., photographer.

"Have four children and there is plenty of room with all of us in the car. Trunk space is wonderful. Takes a baby carriage with trunk closed and has room to spare."—Rahway, N. J., salesman.

"Adequate room for family with six children. Comfortable ride. It is an ideal family auto."—Bemidji, Minn., examiner.

Nash is the only American car that features reclining seats and beds. Nash owners like these and many give them as the reason for buying Nash.

"You have a home wherever you are when traveling."—El Monte, Calif., high-lift operator.

"I have a summer camp and was thinking about adding another bedroom. I also wanted a new car. Could not afford both. Killed two birds with one stone and got a Nash. Extra guests sleep in car and very comfortably."—Syracuse, N. Y., salesman.

"Reclining seat is comfortable on long trips, as I like to snooze while my wife drives."—Fresno, Calif., fruit grower.

"I recently moved and by dropping the reclining seats I could fit almost as much stuff in as in a station wagon."—Cliffside Park, N. J., salesman.

Equally popular is Nash visibility.

"Body design allows you to see both front fenders."—Elberon, N. J., heat treater.

As in the entire Nash line, the most frequent complaint among Statesman owners was the large turn circle.

"Skirted front fenders look good, but not worth loss of short turning radius."—Midland, Tex., salesman.

Other complaints include:

"The car would flood up every time it rained. To this day it still leaks."—Long Island, N. Y., salesman.

"Too large. Will not fit in older garages."—Long Island City, N. Y., owner.

"Does not have enough pickup for passing cars."—Elgin, Ill., retailer.

"Expected much more of the added 15 horsepower between the 1951 and 1953 models."—St. Maries, Idaho, businessman.

"Poor visibility at right front due to large corner post."—Longview, Tex., salesman.

"Gas pedal too uncomfortable and too far to one side."—Everett, Mass., fireman.

"Very hard to park."—San Bernardino, Calif., telegrapher.

"At high speeds with car loaded, brakes seem inadequate."—Shawano, Wis., priest.

"Cooling system too small. Car heats in traffic."—Bridgeport, Ohio, mechanic.

"Big depreciation when ready to trade."—E. Paterson, N. J., office manager.

(Continued to page 250)

Fish Netting Strung Over Pipes Traps Deer Without Injury

Wildlife researchers have found a trap that captures deer easily and without injury. The trap, devised by Melvin R. Clover of California's Department of Fish and Game, consists of fish netting strung on an iron-pipe frame. Gates at either end are held up by a pair of wire hooks. When a deer reaches for sliced-apple bait in the trap, its front feet hit a thread about six inches from the ground. This sets off a rattrap that jerks a cord leading to the hooks at both gates, causing the gates to drop and enclose the animal. The rope netting cannot injure a struggling deer, as did the wire netting formerly used on traps, and side ropes tied to trees keep the trap from tipping over. Deer are removed from the trap through a catch net placed at one end, hobbled and tagged with



a colored-plastic disk attached to its ear. Conservationists later obtain important herd-management data by recapturing deer or observing the disks, which are of various colors and sizes, with binoculars.

Table-Model "Brain" Solves Barn Problems

Helping farmers solve the temperature and humidity problems of their barns, a miniature electronic "brain" absorbs a mass of information and comes up with a quick answer. You twist a certain knob to indicate the number of animals in the barn and another to register the heat and moisture each produces. Other dials are set at the various temperature and humidity marks of different areas of the building. The machine then calculates whether the barn needs a temperature or humidity-control system, or a furnace, and tells what size ventilating system is necessary. The portable brain is believed to be the first such device designed for agricultural use.



Portable Electric Shaver Runs on Flashlight Batteries

Ordinary flashlight batteries or a six-volt automobile battery will power a new portable electric shaver. Equipped with an adaptor for an automobile lighter socket, it uses less than $\frac{1}{10}$ as much current as a car radio. The shaver's two rotary action heads are operated by a brush-type motor which requires no lubrication. Twelve self-sharpening cutters in the two heads are designed to speed shaving by exposing maximum beard area to the cutters. A mirror is attached to the steel battery container.





Buckle-on Stilts Aid Home Construction Workers

Stilts have replaced scaffolds for a construction crew in Detroit, Mich. "Tall" men roam through partially finished homes applying insulation between the ceiling joists. The stilts are the inspiration of Hugh R. Dodge, an insulation contractor. The idea occurred to him as he watched his men

work from a sawhorse scaffold, then climb down, dismantle it and set it up again. Dodge built some crude stilts that could be buckled to the legs. The 12 men of his crew took to the idea immediately. Now the whole crew works on stilts, long ones for the short men, short ones for the long men.

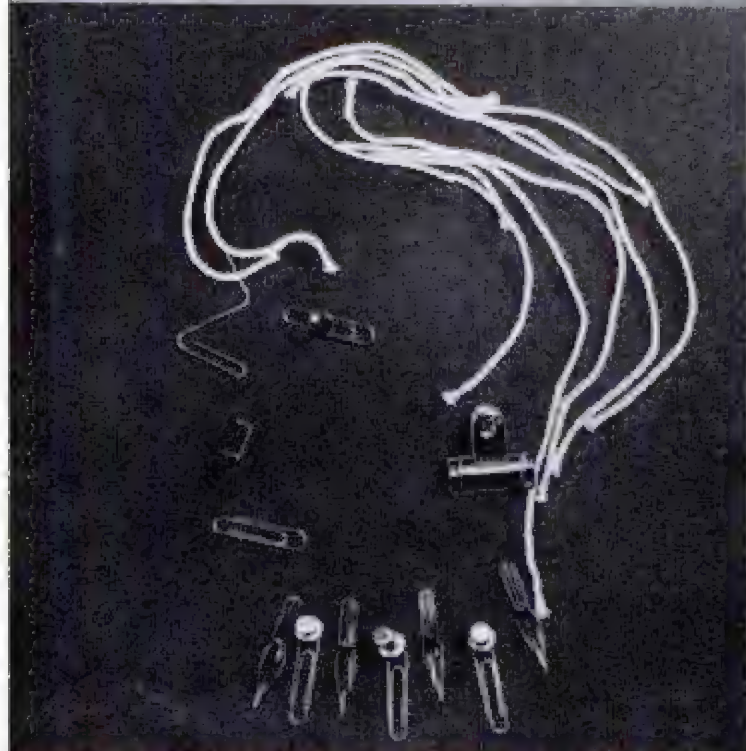
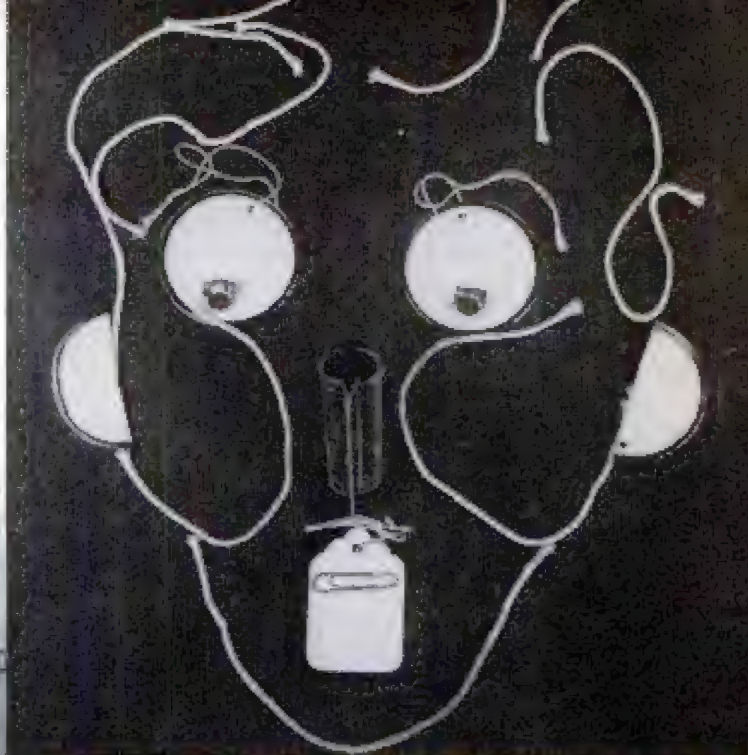
Electric Drainboard Dries Dishes Rapidly

Wiping the dishes is one chore English housewife Sally Hodges won't ever have to perform. She's invented an electrically heated drainboard which dries dishes as soon as they come out of the dishpan. The board can also be used to keep meals warm.

Pocket-Size Phonograph Designed for Displays

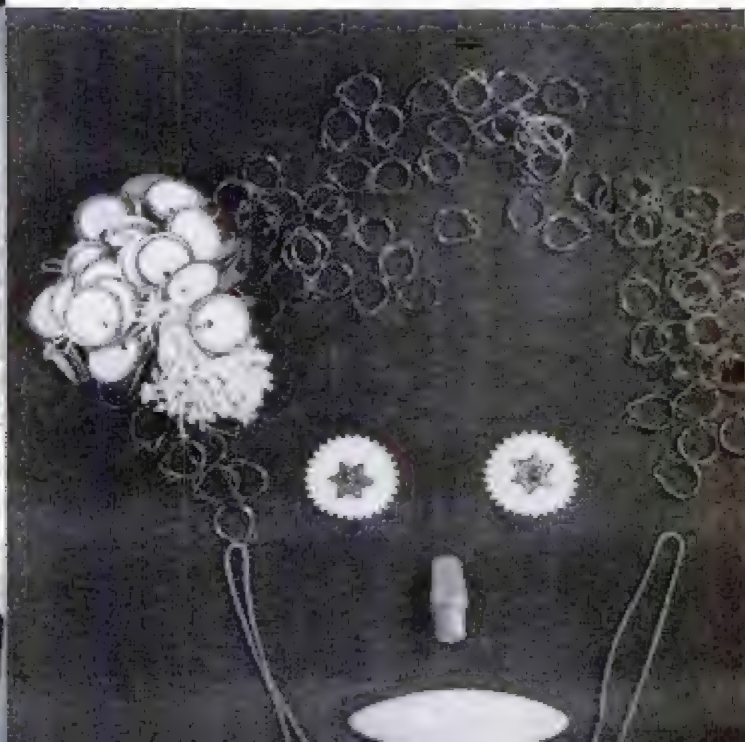
Heralded as "the world's smallest phonograph," a tiny record player spins a 3½-inch disc. Powered by two flashlight batteries, it is designed for displays and training aids. Placed inside the product on exhibit, it delivers a 50-second message.





Folks Around the Office

ONCE UPON A TIME an office worker, sleepily reporting for his day's work, found a box of paper clips spilled across his desk. What struck his attention was that they seemed to outline a man's head. The worker idly began some experiments of his own with paper clips, erasers, rubber bands and tags. On this page you see his results, and anyone who has ever worked in a large office will recognize the spinster, the popeyed new employee, the dumb blonde, the project manager and the private secretary, all "drawn" with ordinary office materials. Try it yourself sometime!



HELICOPTER TUG

West Coast designer foresees rotary-wing craft lowering and lifting tomorrow's transports and fighters in and out of small landing sites

JET TRANSPORTS of the future may be lifted from downtown locations by high-powered helicopter tugs that would detach themselves after the transports attain flying speed. That's the expectation of Dr. J. A. J. Bennett of Hiller Helicopters, who

has applied for patents covering several features of the idea.

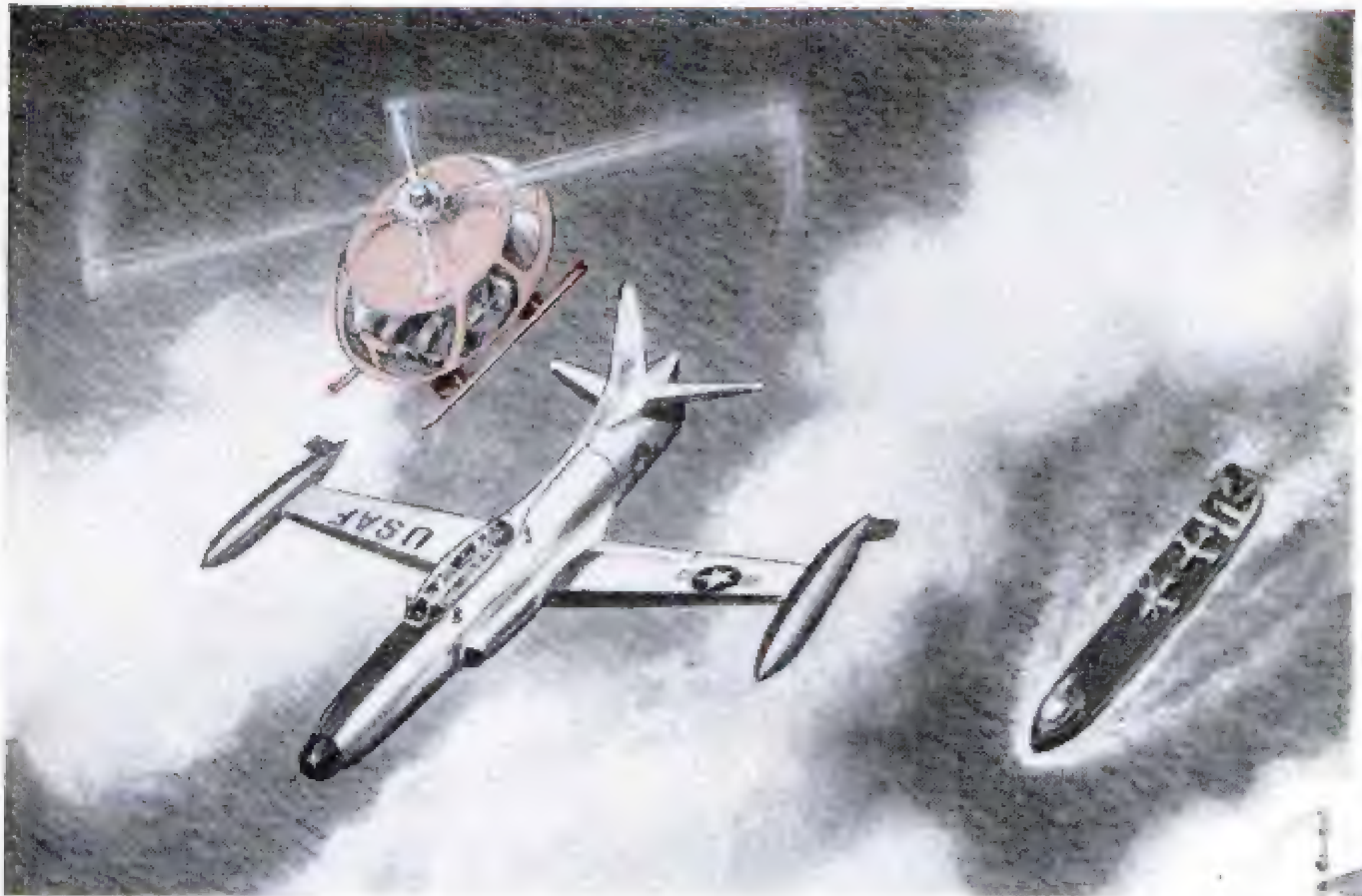
The same helicopter tugs could fasten themselves to incoming transports and lower them safely and almost vertically.

This new method of assisting fast aircraft in and out of small landing sites would eliminate the need for long runways and the present necessity of locating airports at considerable distances from city centers.

Other benefits are that transports no longer would require the heavy landing gear they now carry, and they could operate at higher wing loadings.



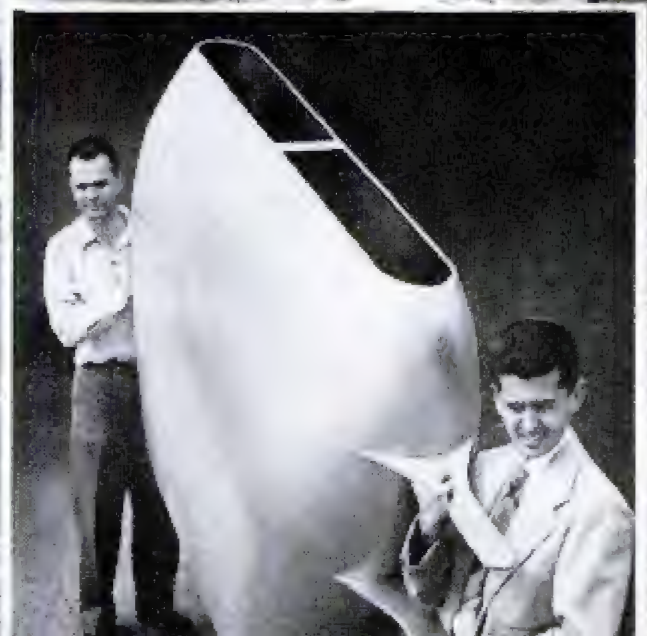
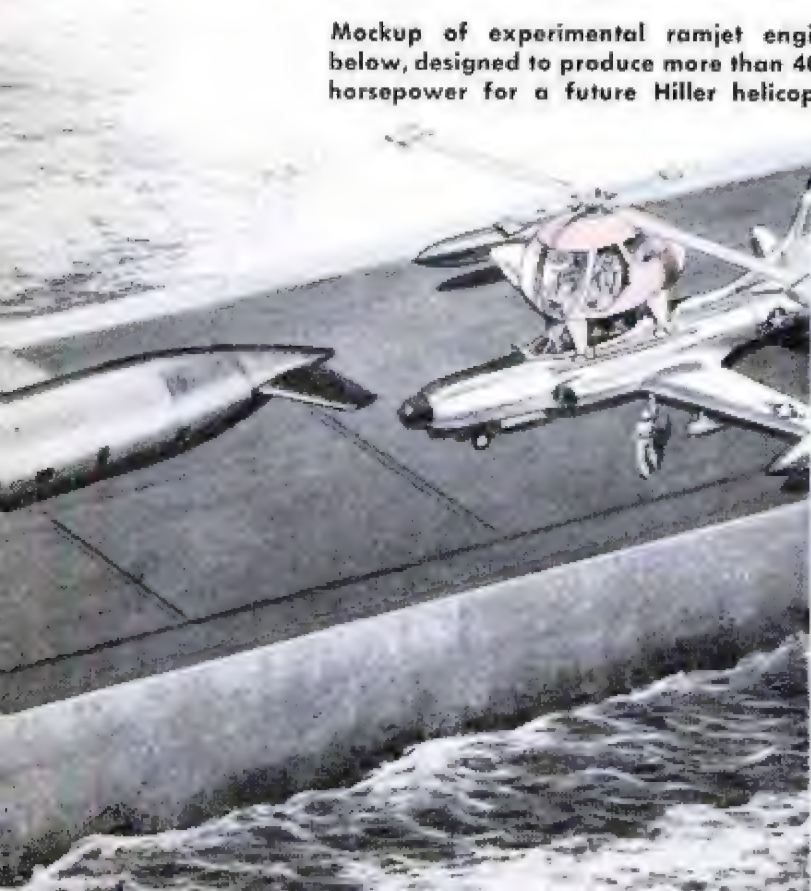
TO LAUNCH PLANES

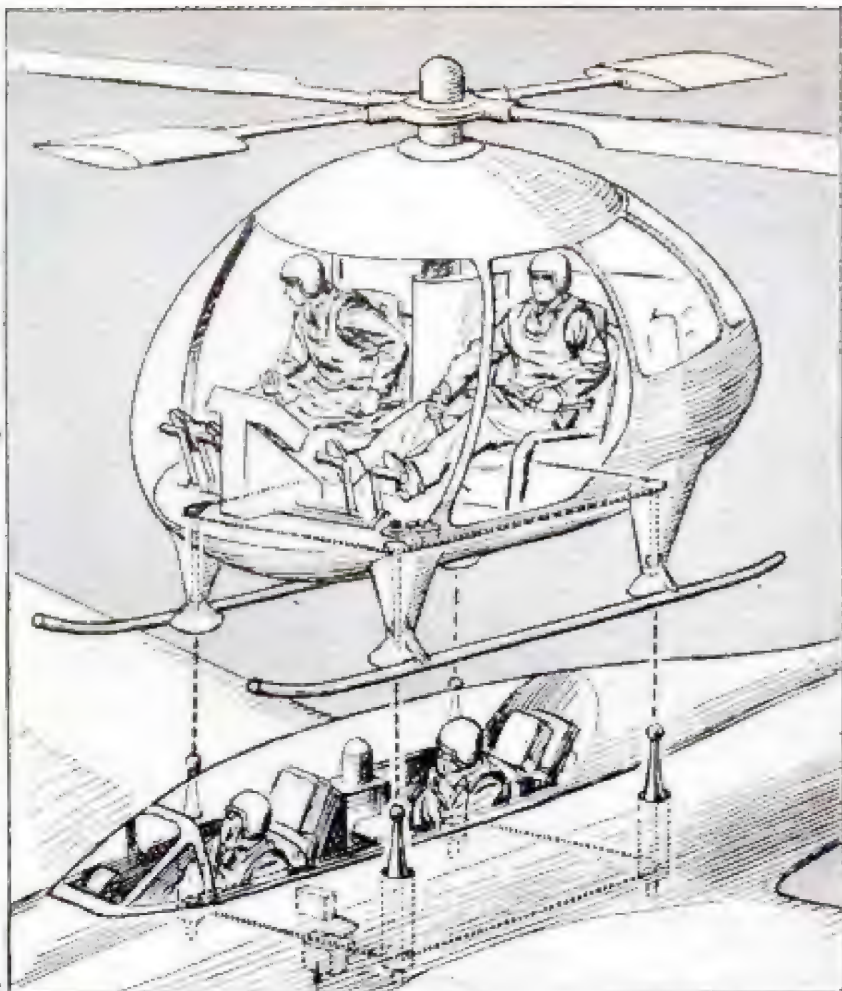
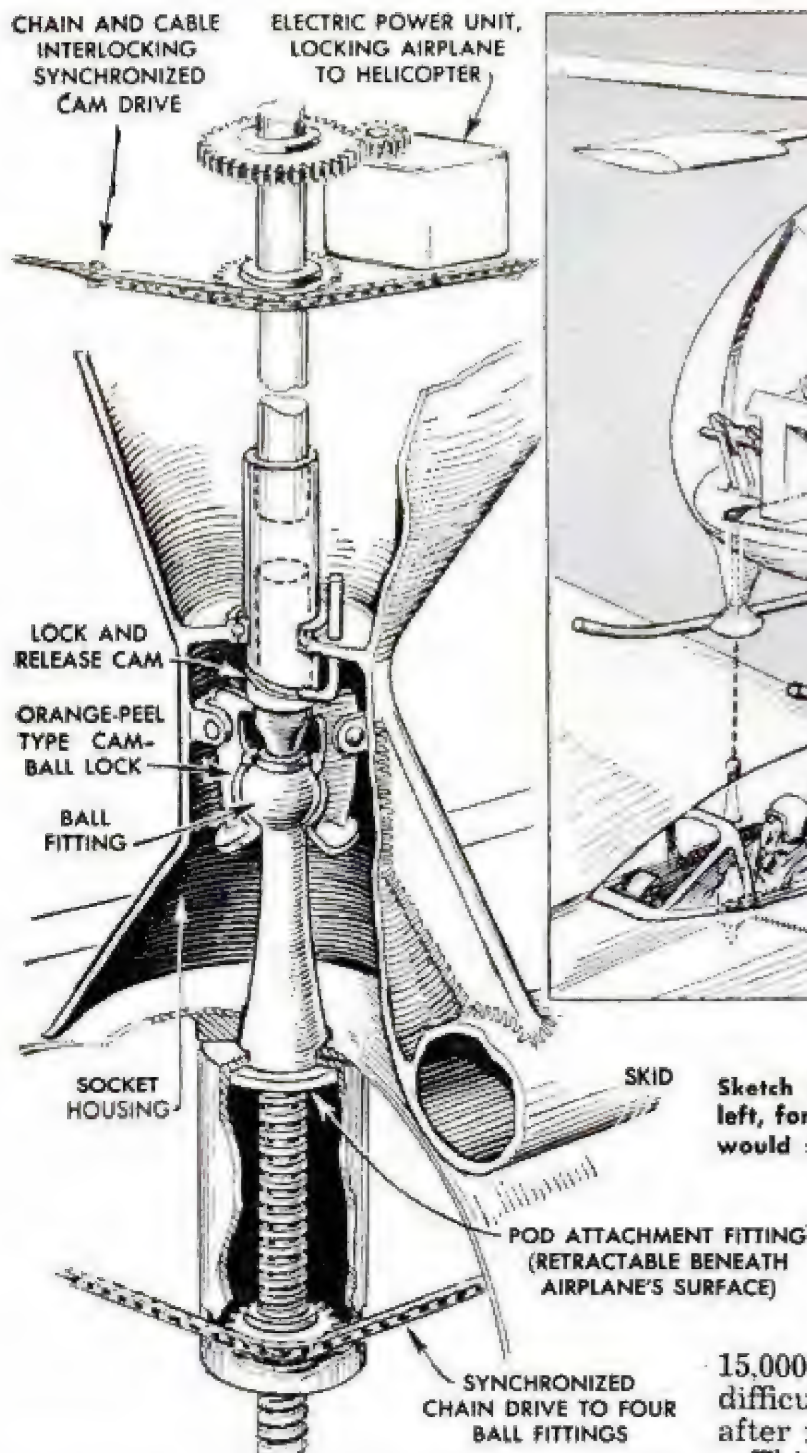


Jet fighters could be carried from cramped decks to sufficient altitude for release

Doctor Bennett points out that the problems associated with release and re-attachment in flight are somewhat comparable to those already solved in the refueling of aircraft by tanker planes. Methods of attachment by a helicopter tug riding piggy back on top of a transport are covered in his patent

Mockup of experimental ramjet engine, below, designed to produce more than 4000 horsepower for a future Hiller helicopter





ELECTRIC POWER UNIT

Sketch of Doctor Bennett's quick-release mechanism, left, for locking airplane to helicopter. Carrying craft would straddle the cockpit canopy of fighter below

applications, together with quick-release methods. There appear to be no particular problems concerned with transitional speeds, and helicopters now being designed would be capable of attaining speeds fast enough to more than match the approach speeds of transports.

"The tug pilot would perform a function similar to that of a pilot at a port for ocean ships," Doctor Bennett explains. "He knows all the local hazards and is skilled in port navigation. This local knowledge would be especially valuable during a final let-down through cloud conditions. The tug and transport pilots would communicate by telephone meanwhile, similar to the intercommunication between the bridge and engine room of a ship."

Helicopter tugs also would be valuable for launching fighter or search aircraft

from the deck of a ship. Doctor Bennett estimates that a helicopter tug having a rotor diameter of 75 feet and powered with ramjet engines at the rotor tips could lift a 15,000-pound fighter into the air without difficulty, then lower it again to shipboard after re-attachment.

This helicopter "elevator service" would permit full utilization of all available deck space for parked aircraft.

Large helicopter tugs will require ramjet engines of tremendous horsepower. One experimental design prepared by the Hiller propulsion section develops an estimated 4200 horsepower, providing a total of 8400 horsepower at the rotor tips.

Probably the helicopter tugs will dispense with the usual tail or antitorque rotor because of another Bennett development. Ramjet-powered helicopters require a small auxiliary engine to sweep the rotor blades around and thus start the engines. Doctor Bennett proposes that the auxiliary engine continue to apply power to the rotor shaft during the entire flight. This would balance the usual friction from hub bearings and accessories and allow the pilot to rotate the fuselage in either direction. ★ ★ ★



In bitter cold, crew drills hole for dynamite charge that will set off shock wave to map earth's subsurface

Prospectors in Parkas Chart Canada's Oil

Temperatures sink to 70 degrees below zero, diesel fuel turns to slush and it may take 24 hours to start a truck engine with a blowtorch, but still the search for oil goes on

By John P. Tolbert

Photos by Harry Rowed

ONE OF THE HOTTEST oil areas in North America today is also the coldest. In terms of competition, western Canada—including northern Alberta, the Northwest Territories and British Columbia—is hot indeed, with most of the major oil companies involved. In terms of temperature, this search for oil goes on at 70 degrees below zero in the winter, with few trees to break the wind that knifes through to your marrow.

It's doubtful that oil men ever operated in such an uncomfortable climate, not even excluding Saudi Arabia's 125-degree summers. Certainly they never operated in a more remote area nor with any greater

dependence on airplanes and the radio.

Despite the discomfort that often amounts to physical pain, winter is still the best season for oil explorations in this part of Canada. The solid freeze makes good highways out of rivers and lakes, and bulldozers can cut roads through deep snows better than they can snake across the soft muskeg. Living in this country in the winter, you have to develop a whole new set of reflexes, learn to understand the weather with all its whims and deceptions and adapt yourself to it. Men—and this is strictly a man's country—have frozen to death standing up without ever realizing they were cold.

With the right sort of clothing and care, though, you can stay out in the open for hours. The men in this vast freezer wear heavy underclothing, extra trousers, sweaters, parkas, mukluks, mitts and sometimes flight suits and flight boots. The critical factor is not the temperature alone but also the wind velocity—what the U. S. Army calls the “wind chill” factor. A high-calorie diet helps, but whiskey and other forms of alcohol are forbidden because they can lull you into a deceptive sense of warmth.

In those vast frozen wastes that stretch to the North Pole—“down north to the Arctic” they say up there—you take care of your equipment the way a foot soldier nurses his feet. In dead winter, you keep your equipment running 24 hours a day—bulldozers, jeeps, weasels (tracked vehicles that move on land or water), bombardiers (a sort of cousin to the Army’s half-track) and motor-driven toboggans. If an engine

stops for long it may take you 24 hours to restart it, even with a blowtorch. If it stops when you’re alone any distance from camp, you may not live long enough to get it started again.

Every nut, bolt, cigarette, magazine and bite of food has to be brought in from “civilization,” which may be several hundred miles away. Ski-equipped bush planes, flown by some of the greatest pilots in the world, carry most of the load. Bulldozers ferry in long trains of ski-mounted carriers and bring up the trailers used for housing and offices. The oilmen eat well—a high-calorie diet is essential—but they don’t waste even a morsel of bread. They’re the perfect conservationists; they safeguard every nail, every tool, every drop of fuel.

Fuel, incidentally, is an interesting problem itself. Diesel fuel for bulldozers can freeze into a sluggish white mass too thick

In some areas, every nut, bolt, cigarette and cracker must be flown part way, then transferred to dog sled



to pour. This fuel is diluted with kerosene to help move it through the fuel line. Very lightweight lubricants are used, and special arctic gear oils.

Airplanes, being such a high-priority item, get special handling. Whenever the motor is cut for a stop of any duration, a tent is lashed tight over the engine and propeller. A small stove placed inside the tent for 30 or 45 minutes helps warm up the engine when the pilot is ready to start it again. The engine oil is diluted with gasoline, which burns off quickly after the engine starts. The planes have to be anchored securely with guy wires, as the high winds can wreck a plane in a matter of minutes.

In the warmer part of winter, when the mercury jumps up to around 30 below, oilmen sometimes resort to a time-tested means of crossing a frozen stream when they aren't sure how thick the ice is. They melt huge quantities of snow in boilers,



Home freezer, arctic style. After each snow the men must shovel their way to the crude food-storage shack



Here's the goal—a producing oil well. This one was drilled in Alberta. Flare in background burns off gas as safety measure. Below, "jug hustler" plants a Geophone which is connected by cable to recording truck. Geophones pick up shock waves after explosion





Seismic crew leaves trailer home for day's shooting. In midwinter, daylight only lasts four or five hours

pour the water thus obtained on the snow-covered stream and let it freeze. This way they know how much ice they have. A bulldozer needs 24 inches of ice for a comfortable safety factor. If they lose a bulldozer through the ice at a critical time, and some companies have, they may have to disassemble a bulldozer hundreds of miles to the south, fly in the components, reassemble the machine and then spend a day or so starting its engine.

Where only small, fairly light loads are involved, oilmen sometimes bypass this sort of "road building" by using dog teams. Sled dogs, used in unloading planes in many places, can go almost anywhere with

Torch melts ice in tank so men can mix drilling mud. Water supply is continual problem—it's always ice



any sort of decent footing. They have enormous appetites, which can be satisfied largely by fish caught through the ice, and unpredictable dispositions, which are better left to the care of old dog-handlers who understand their personalities.

All of this costly, time-consuming, uncomfortable operation is designed to support what looks like a simple business of shooting off dynamite in the ground. Because there aren't enough surface outcrops of rock in the region to be of much help to geologists, seismic shooting is the best way to map the earth thousands of feet below the surface. This mapping locates the types of structures that can trap oil if there's oil to be trapped. Only the drilling bits, backed by hundreds of thousands of dollars, can finally determine the presence or absence of oil, but there's no point in drilling until you know you're on a favorable structure.

The dynamite is placed in holes anywhere from 30 to 200 feet deep. Geophones, connected by wire to a recording truck, are strung out over a wide area to detect shock waves that bounce back to the surface whenever the waves set off by the blast encounter a different type of rock. The Geophones translate the shocks into electrical impulses, which are amplified and recorded on moving strips of photographic paper. Part of the wave keeps going down until it hits a new stratum of rock. Then, again, some of the wave bounces back to the surface and some of it keeps going until it finally hits "basement rock," the last reflecting horizon. This is igneous rock, once molten, in which oil has never been found. Oil is found only in the sedimentary



Main street in exploration area is road plowed by bulldozer. Oilmen have cut thousands of miles of such roads

rocks laid down slowly over millions of years. Seismic interpreters can read the squiggles that show up on the records and map the earth's subsurface with astonishing accuracy.

The surveyors and rodmen who plot locations for the shot holes often have to work hip-deep in snow, and there are no snack-bars where a man can put in for a

cup of coffee. The "jug hustlers," the men who position the Geophones, also slog through deep drifts. The "elite corps" is the drilling crew, with the men riding up on the truck-mounted, collapsible rigs. Bulldozers have to precede trucks every foot of the way. A good bulldozer operator—a "cat skinner"—can cut a straight road for long distances by dead reckoning.

White area on the map is the territory now being charted for oil. Note the two pipe lines from Edmonton





Men carefully tamp a charge of dynamite into a shot hole. Wire will link the detonator to shooting truck



"Fire in the hole!" is standard cry of blasters everywhere. When he presses the button—BOOM!

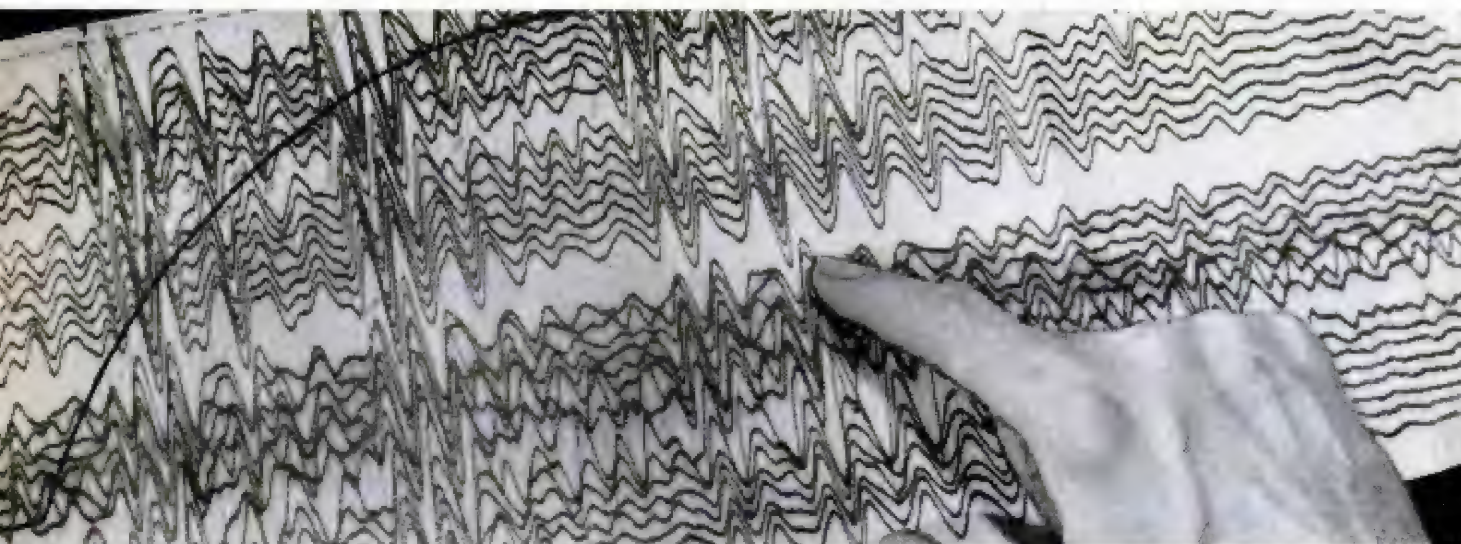


Seismic observer operates a complicated instrument panel inside truck. He determines placement of the dynamite, decides whether a re-shoot is necessary

Socony-Vacuum Oil Company, one of the largest operators in the western Canadian play, with exploration rights on millions of acres, estimates that its bulldozers have cut close to 2000 miles of road in that wilderness.

If and when oil on a commercial scale is found in this region, moving it to markets will present a problem, but oilmen think they can lick it. They've built pipe lines over 1000 miles long through the Arabian desert, the Venezuelan jungles, and across the Mississippi River. They're confident they can lay pipe lines even in the muskeg country of western Canada. The shortest route, in miles, would be to cut straight through to the Pacific Coast and to build a terminal and tanker docks from which the crude oil could be moved to the United States West Coast. But this would mean crossing the rugged Canadian

Finger points to broad wiggles that denote reflections of shock wave from rock structures beneath the surface



Rockies, so the probable solution will be a line possibly 400 to 700 miles long that would tap into one of two other pipe lines: Either the Inter-Provincial line from Edmonton, Alta., east to Superior, Wis.; or the Trans Mountain line now under construction from Edmonton to Vancouver, B. C.

Such a pipe line from the north country might have to run above ground part of the way, floating on the marshy muskeg. It would have to withstand contraction and expansion caused by temperature ranges from 70 below to 100 above, but pipe liners have mastered similar problems.

Until oil is actually found in commercial quantities, discussion of a pipe line to move it is just conjecture. But pipe liners have already done a lot of informed conjecturing about it. They say the three main factors that will determine the whole nature of the pipe line are the terrain, the quantities of crude oil to be moved and the characteristics of the crude oil.

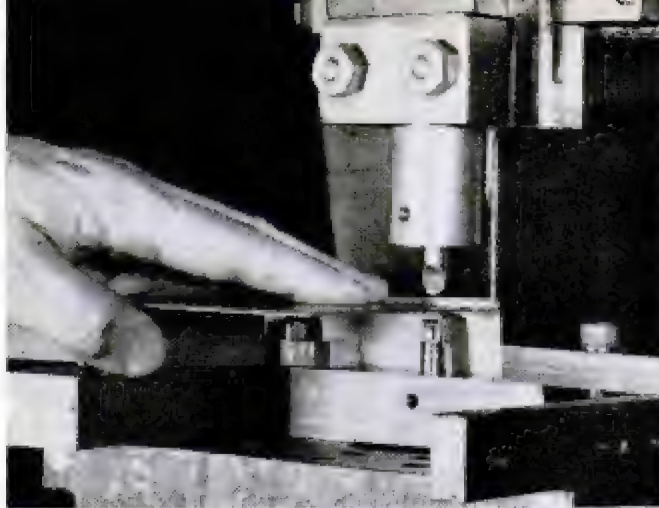
The terrain is pretty well known already. The line could be buried four or five feet or more over much of the route. This would mean costly ditch-digging, but it would reduce somewhat the heating required to keep the oil flowing. The line would probably be buried eight feet or more under the beds of rivers and streams. Where the line had to be floated on top of the muskeg, more heating facilities would be required. In either case, the line would be insulated as heavily as possible. A protective

(Continued to page 262)



Surveyors who plot the shot holes and Geophone locations have to wade through knee-deep, sometimes hip-deep snow. Below, when it's time to move camp, trucks or bulldozers haul the skid-mounted trailer houses to a new area





Descending action of punch makes a parallel double notch in metal sheets, "buttoning" them together

Metal Sheets "Buttoned" Together Without Rivets or Bolts

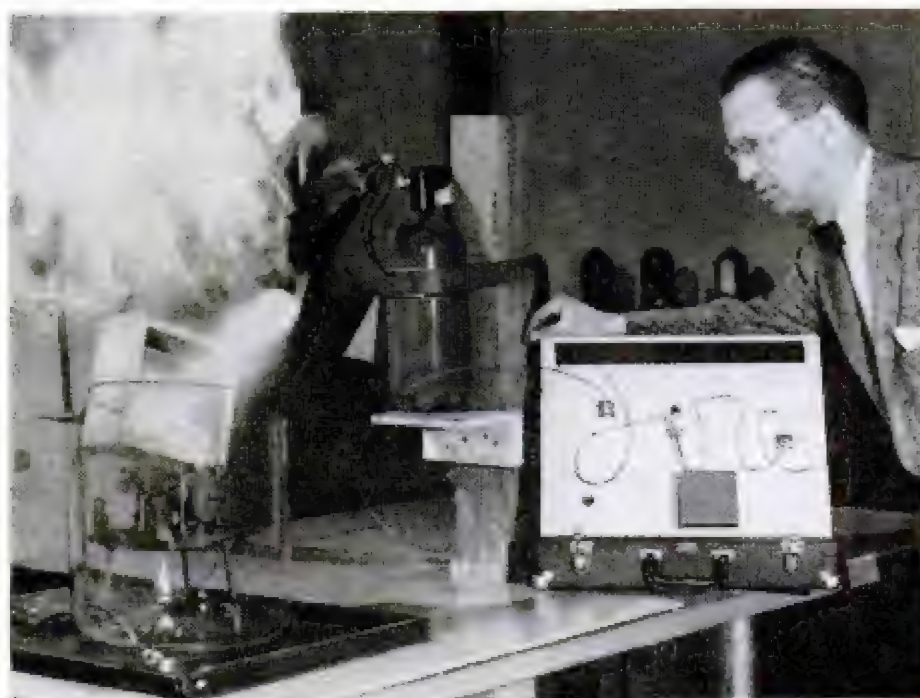
Top and bottom views of sheet steel after punching



"Buttoning" metal sheets together, a new method of fastening, does away with rivets, bolts, solder or welding. From 25 to 50 percent faster than usual methods, the process employs a punch and die which can be used in any punch press or incorporated in a special fastening machine. In a one-step operation, the device shears through the metal with parallel cuts in both sheets. After the incision the metal is rammed downward by the punch against the movable jaws of the die underneath where the impact depresses the metal sideways. This produces a buttoning effect that compares favorably with riveting. In tests, the fastening held while the metal actually broke under stress. The new method can be used to fasten sheets of metal up to $\frac{1}{4}$ -inch thick. It works equally well on sheets of dissimilar metals such as steel and aluminum.

Fire-Sensitive Cable Developed for Airplane Protection

Sensitive along its entire length to any touch of flame, a cable developed at Edison Laboratory for use in aircraft produces an electrical current that activates a fire alarm. In a recent demonstration, the cable was wrapped around a gasoline-soaked wooden box, then extended to an instrument panel connected to an alarm and a fire extinguisher. The box was ignited and the fire was extinguished automatically. The cable will be used to supplement other warning systems, particularly around the airplane engine.





Robot Song Master Stimulates Sunday-School Singing

Youngsters sing their lungs out to please a robot who draws big crowds to a Seattle Sunday-school class. "Sam" has eyes of radio tubes and light-bulb ears, a big square face and a grinning mouth. As the volume

of singing increases, bulbs light up and Sam's long red tongue wags back and forth. Besides functioning like an applause meter, Sam tells short Bible stories by means of a hidden tape recorder.

"Daylight" Machine Makes X-Ray Prints Available in Minute

With a new type of laboratory equipment, X-ray prints are available within one minute after the picture is taken. The system is similar to that used in the Polaroid Land camera. No darkroom or wet chemicals are needed. The chemicals required to make the print are packaged with the sheet of film.

☐ Oceanographers have found that the greatest ocean waves, which reach a height of 300 feet, occur deep in the sea at the boundary of two unmixed bodies of water—such as water layers of different temperatures—one layer welling high up into the other one.





Surveyor followed by tractor and plow lays out paddies of different elevations in big California rice field



THEY ARE SAYING that Paul Bunyan caught the sniffles in the cold north woods and so he and Blue Ox moved to the huge Sacramento Valley of California where they now act like coolies and soak up vitamin D in warm rice fields just their size. You would think so, too! The five-by-five rice paddy and barefooted coolie are completely unknown in the vast ricelands of California. If anyone were to wander into those enormous paddies with an ordinary shovel or hoe, he immediately would be measured as a hump by precision surveyors, leveled off by gigantic scrapers and either dived at by a guarding airplane or sprayed by helicopter as a new type of bug. The standard movie-type coolie would feel more at home paddling an iceberg.

Rice, no longer a staple food in just the Orient, is big business in Louisiana, Texas, Arkansas and California. The United States produces over 2,000,000,000 pounds of rice yearly, second only to China, and exports more than half of it back to Asia. Why? Because there the coolie farmer must labor so hard with primitive methods that he barely produces enough rice to keep himself alive. The Orient's city-dwellers are left short. In California and in our other rice-growing states, modern mechanical farming is completely reversing the picture—truly Paul Bunyan farming that pro-

Plane flying 20 to 40 feet high seeds the flooded fields. Splashes in foreground are made by seeds

**Movie-type coolies
splashing through rice paddies
have been replaced by
giant machines in California
where they grow**



Rice by the Square Mile

By Tom Riley

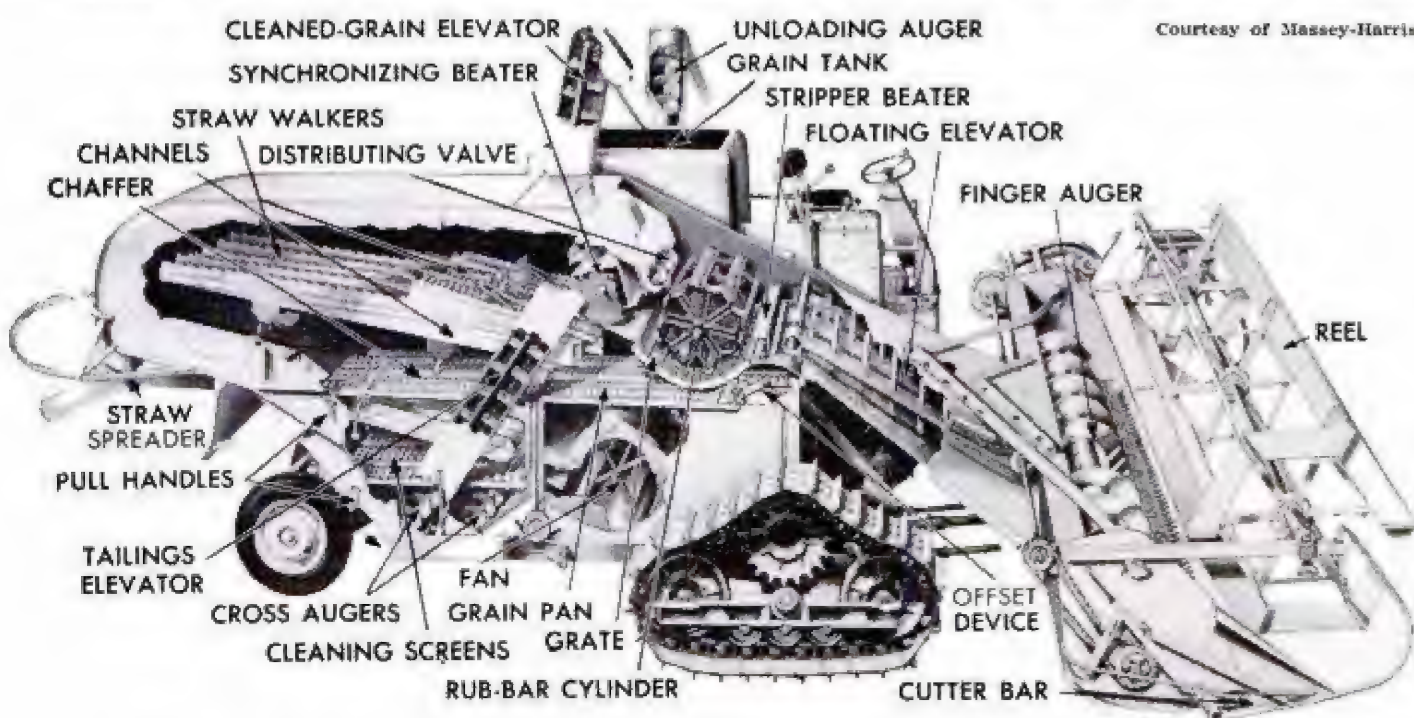
duces huge surpluses of rice in paddies untouched by any form of hand labor.

Growing rice is a specialty. For centuries, it has been grown in the typical tiny paddy where it could be meticulously cultivated and cared for by hand. In the California paddies, rice is grown by the new continuous-submergence method, discovered at Biggs, Calif., 25 years ago. Instead of keeping the ground moist with many floodings and drainings, it is kept completely submerged under six to eight inches of water

throughout the growing season. The rice does well in the submerged land, which thus drowns out wild grasses and other weeds which, if present, would have to be removed by hand from the soggy ground. With the problem of weeding eliminated, technicians and machinery are able to take over completely the work of the coolie.

Surveyors are as important in the big fields as farmers. Each season, skilled surveyors lay out the huge rice paddies and draw highly accurate contour maps on the

Cutaway of rice harvester below shows intricate mechanism of huge machine that cuts and threshes the grain



Courtesy of Massey-Harris



This rice field has been leveled, contoured and flooded and will be seeded after aerial-photo checking

ground itself. The large paddies must be absolutely level for the continuous-submergence farming; otherwise the yield will be spotty and weeds will appear through the water. The fields also need to be level in order to drain evenly and quickly in the fall when the rice is ripe. Heavy harvesting machinery must move in fast before fall rains can spoil the crop.

The surveyors level these fields with the most precise coincidence-reading engineers' levels available, and they level them by subdividing the fields with meandering contour lines. Contours are the wriggly lines you see on accurate maps, each line indicating a certain elevation around a hill or across a seemingly level field. For instance, the edge of a lake is a contour line. By accurately locating contours across the huge fields, each contour two or three inches higher or lower than the next, the surveyor establishes level grade lines and also locates the land for each paddy. The

paddies are formed of the land between contour lines that can economically be graded flat. As the surveyor traces the contour lines with his instruments, a tractor drawing a gang plow closely follows him and thus plows in or marks the contours on the ground.

The land between the contour lines is usually leveled flat with huge land planes, special 80-foot planes made for the rice fields. However, if the land is already fairly level, it is smoothed down by drags behind tractors. Checking machines, 16-foot snow-plows in reverse, are drawn along the contour lines behind two large tractors to scoop up enough soil to form three to four-foot-high checks or dikes. Thus the fields, often two miles across, are subdivided into large paddies, each a two or three-inch step higher than the next. If all the land in an especially flat field is on one level, the checks are still put in—to prevent the wind from building up large waves on the shal-

Land planes which are 80 feet long are dragged by tractor across the fields until they are perfectly flat



low lake, waves which could break the dikes.

Next, the fields are flooded from irrigation ditches through wooden gates built in the checks. So accurate must the leveling be that the fields are now flooded to a two-inch depth in each contour or paddy and are checked by taking aerial photos. The photos will show up in light and dark spots any shallow or deep areas that may need releveing. Seldom is releveing necessary, even in paddies that meander over miles. All this work is redone each year, because the old dikes are leveled out to remove accumulated weeds and to allow plowing the entire field.

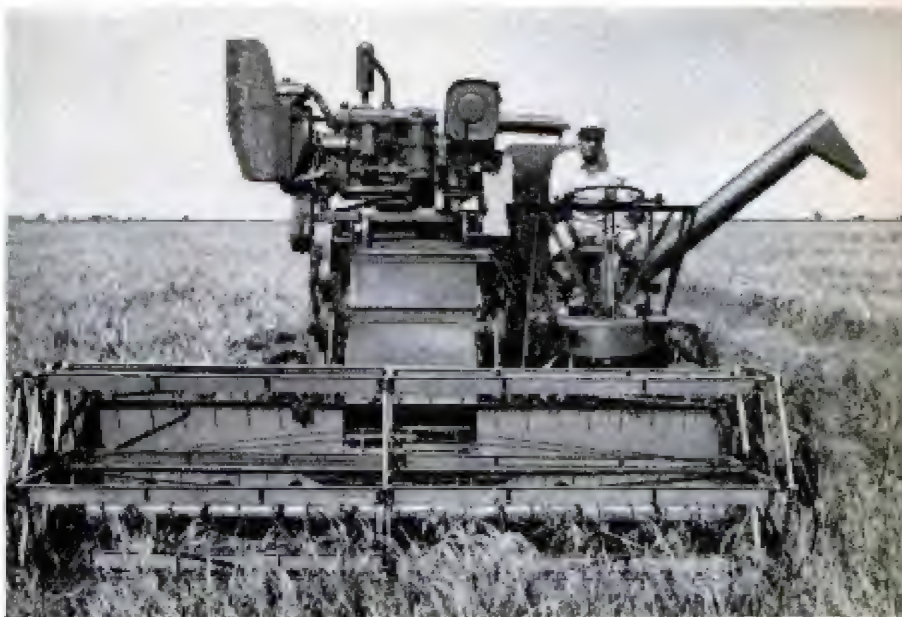
When the fields are photo-checked, the surveyor relinquishes his job as farmer to the airplane pilot. Around the last of April, planes seed the inundated fields, spreading seed rice over the water in long, low sweeps. Aerial seeding of the flooded fields is inexpensive, fast and surprisingly requires less seed than hand methods. As the rice grows up through and above the water, spray equipment is attached to the busy airplanes. The pilots spray any weed-infested paddy with 2,4-D, the same as you would do to your lawn. Helicopters are also brought in for the spraying, because they can best reach the corners of the fields where the most weeds grow.

As the rice matures, the pilot farmers of the Sacramento Valley are kept busy at another job, herding wild ducks from the rice which is their favorite food. Whenever a flock of ducks settles in a paddy, a patrolling airplane zooms past—low—to frighten the flock into the air. As the ducks rise, quacking in complaint, the airplane slides in underneath them at slow speed and herds them away toward the Sacramento River and the federal bird refuges there.

The last—and rather anticlimactic part of this Paul Bunyan rice farming—is the harvesting. In October when the rice is ready, the check gates are simply opened to drain the fields. Then combines and bin-type wagons, similar to wheat-harvesting equipment but with everything on wide-cleated tracks, move in across the soft ground to thresh and hustle the bumper crop to the mills. ★ ★ ★



This checking machine scoops up dirt to form a levee along a contour line. It operates like a 16-foot snowplow in reverse

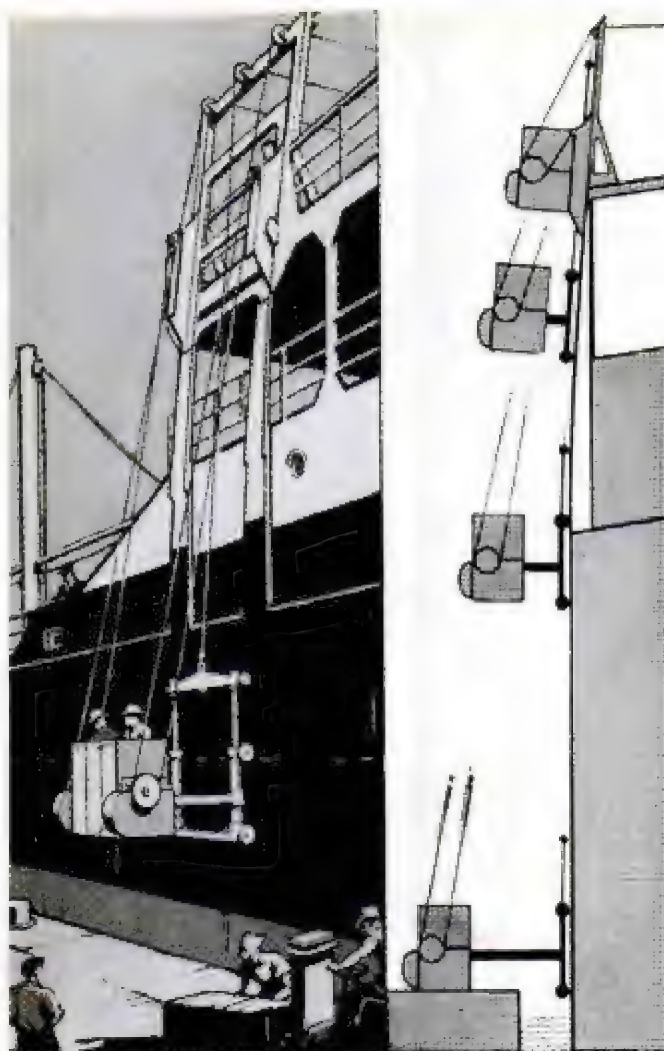


International Harvester Co. photo

Self-propelled rice harvester can do the work of more than 100 coolies in a single day. Operator's seat gives good view

Helicopters are used for spraying weeds in the hard-to-get-at corners of the rice paddies; airplanes are used for main job



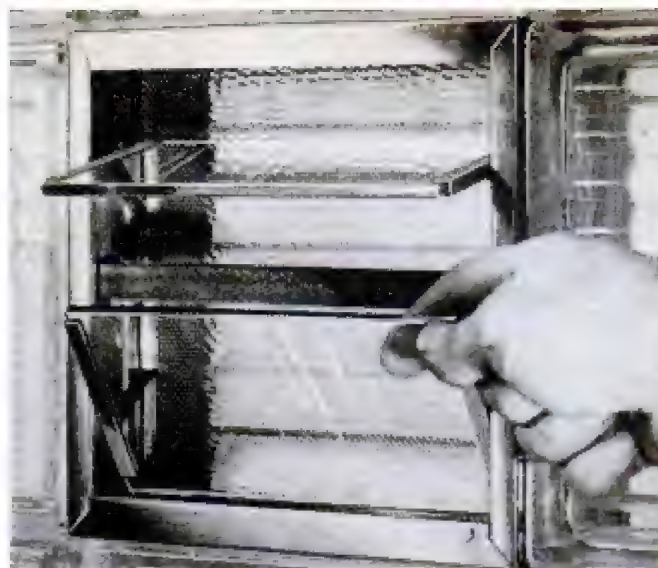


Overside Lift for Ships Carries Six Men or 1000 Pounds

Built to carry six men or 1000 pounds of stores as it rolls up the side of a new oil tanker, an overside lift is not affected by the list or trim of the vessel and is not dependent upon guide rails. Two metal arms extend from the wheeled framework to support the cargo box, which rolls in closer to the ship as it rises, until it is flush at the top of the lift. Electric motors drive the rope-and-pulley hoisting system. The lift eases the difficulty of getting on and off a tanker, which is so high out of the water when its cargo is discharged that the gangway is steeply tilted.

Landing Speed Indicator

Use of a new aircraft instrument, the landing-speed indicator, makes it unnecessary for pilots to calculate airplane weight, flap position, wind and other factors during approaches. This is done automatically by a sensing unit mounted below the wing's leading edge. The unit is connected to an instrument-panel dial with a pointer moving through an arc of 75 degrees, marked by segments colored red, white and green. The pointer remains centered when the airplane is landing at the proper speed.



Individual Ventilator Replaces Glass Block

Translucent glass louvers form the outside face of a ventilator which replaces a glass block in new or old walls. Rain or snow can't enter because of the downward slant of the louvers. Insects and dirt are barred by a wire screen in the middle of the unit. Two pivoting glass plates on the inside face regulate and direct the flow of fresh air or shut it off entirely. It is encased in a reinforced stainless-steel body.

Two-Ribbon Typewriter Emphasizes Selected Portions

When the typist operating a new electric typewriter wishes to emphasize certain words or phrases, she simply flicks a lever and the printing becomes twice as dark and bold. Reason for the difference is a second ribbon made of nylon fabric which rises in front of the regular ribbon when the button is pushed. This padding of the type results in a much thicker impression.

regular print or **this Bold**
typescript at the flick
of a switch.



Hot Rod for Three-Year-Old

Washing-machine engine in rear powers racer. Battery supplies Austin self-starter. Plastic body will cover frame.



Curtis Smith is a California hot rodder and, being only three years old, is probably the world's youngest. His father is a Navy electrician who built a tiny car with tubing from war-surplus Navy cots and powered it with an old washing-machine engine. The wheels are from junked motor scooters and the transmission is a hydraulic unit once used in an aircraft gun turret. The tiny car even has a self-starter, borrowed from a British Austin. At present the car has no body, but Curt's dad is building a sleek plastic shell to dress up the vehicle. Actual top speed of the car is 20 miles per hour, but when Curt drives it the throttle is set for a top of 10 miles per hour. Most of Curt's driving has been on a 200-foot by 400-foot tract in an empty lot near his home, but he has also demonstrated his skill at the Paradise Mesa drag strip near San Diego. He's a veteran driver with several months' experience.

Inflatable Mattress Slips Into Sleeping Bag

Sportsmen who like to "rough it" in comfort will take to a tufted air mattress that fits most sleeping bags. The tufted structure helps the mattress retain shape under varying body pressures. Made of plastic, it remains flexible at low temperatures and folds into a small package for carrying. Inflated by lung pressure, it measures 24 by 72 inches when ready for use.

Annual consumption of paper and paperboard in the United States is now about 31,000,000 tons, or approximately 14 times as much as was used in 1900.



BULLETS STRICTLY FOR BULL'S-EYES



By Claude M. Kreider

PIN-POINT ACCURACY in rifle shooting has been sought by military authorities, hunters and target shooters since the days of the Kentucky "squirrel" rifles, 150 years ago. And, like all rifle "fans," Lorne Harbour and Frank Snow, of Whittier, Calif., were for many years dissatisfied with the accuracy obtained with even the finest equipment. So they did something about it.

Many factors enter into the problem of securing accuracy with the rifle. The first is human error. This may be almost eliminated by the use of a rifle whose special

heavy, "target" barrel is rested upon a firm pad while the shooter sits braced in a modern bench rest. Telescope sights provide clear definition of the target and reduce optical error to the minimum.

The rifle must be accurately bored and the cartridge case must fit its chamber with precision. Each powder charge must be weighed to the tiniest fraction of a grain to secure uniform results and the primer must be capable of instantly igniting it.

There is much more to the intricate science of ballistics, but these are the major necessities for accuracy except—perfect

Partners examine group fired at 328 yards. It's only .656 inch from bullet center to center at widest part



bullets, identical in every respect.

Bullets for superaccurate target work must be precisely formed, shaped to buck the wind and be exactly uniform in weight and dimensions. One thousandth of an inch variation in the bullet's diameter—one fourth the thickness of a human hair—can mean poor accuracy for that one shot.

Harbour and Snow, both expert machinists and tool designers, were joined by a third rifleman, James Spivey, in an effort to improve existing commercial bullets, both in design and machining methods. Their aim was to give the rifle world what it had always wanted—the perfect bullet.

They found that many jacketed bullets used for high-velocity target and game shooting varied as much as three or four grains in weight in bullets weighing 150 grains. This meant low shots on the target for the heavier bullet, higher shots with the lighter ones. Such "loose" grouping could lose a target match. Inaccurate bullets could miss a big-game animal at long range, despite the best of rifle holding, and might even endanger a hunter's life when pursuing dangerous game.

Pooling their engineering ability and ballistic know-how, these men have adapted a high-speed punch press for making jacketed bullets. They start with a jacket material of copper, to which is added five percent of zinc. This metal is capable of easy and accurate drawing to shape and has been found to cause little erosion in rifle barrels.

Inside each copper jacket is a core of lead, the only metal capable of providing the necessary weight for a given length and bullet diameter. It must be pressed firmly in place. And for big-game shooting, only a lead core with an exposed or expanding bullet point will give the necessary mushrooming effect for instantly killing large game.

Nearly all high-velocity bullets are of "spitzer" point design, tapering from the bore diameter in a constant curve to the sharp bullet point. A variation here of a fraction of a thousandth of an inch means an inaccurate bullet.

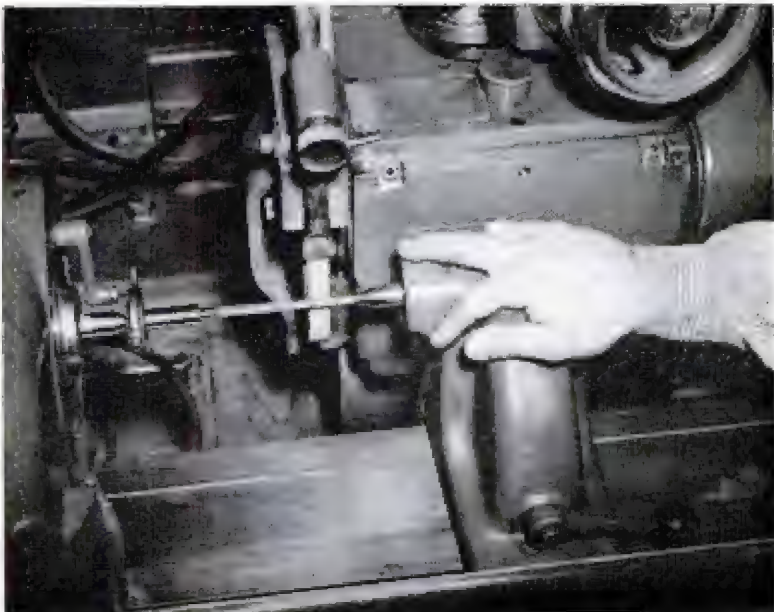
For months, this little three-man firm worked at the lathes and grinding machines, making and

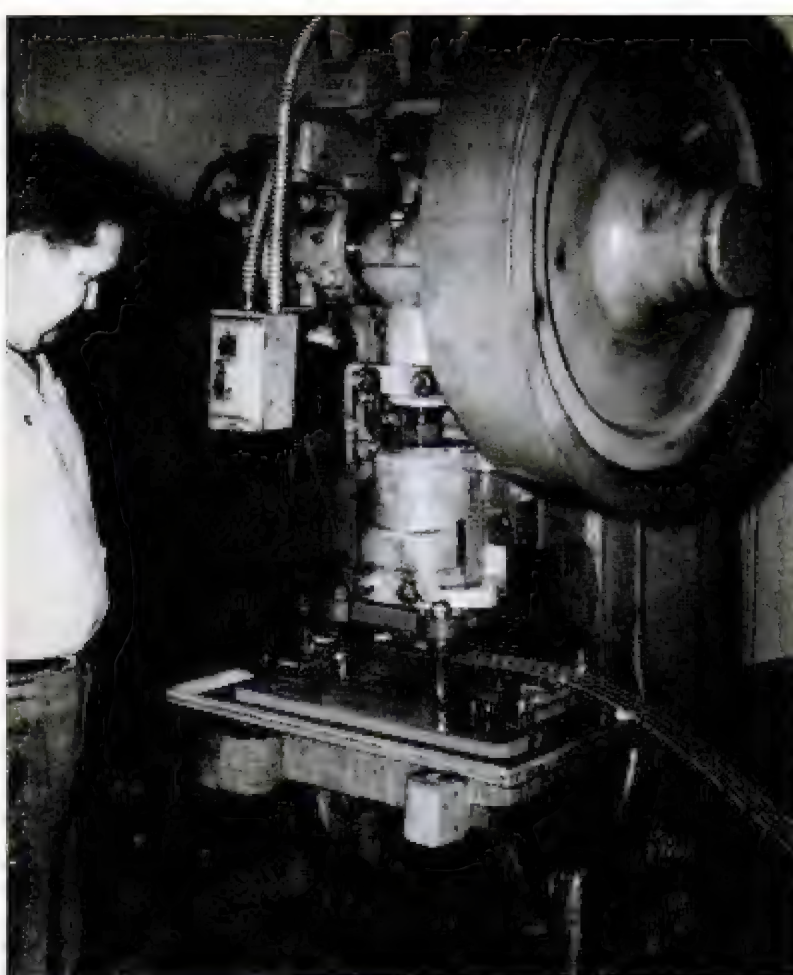


Superaccurate, .30-caliber bullets must be uniform in weight. A bullet which varies more than a fifth of a grain is rejected



More than 300,000 cups in the large barrel will go through successive drawing operations to shape them to the exact jacket size of those in bucket. Below, precision tools are a necessity. Here a superaccurate die is ground automatically





In first bullet-making operation, ribbon of copper alloy moves through press which stamps out and forms 20,000 cups per hour

testing dies, and finally putting into action a superaccurate and automatic die press for bullet shaping. They made bullets, changed design, made more and tried them on the target range in the finest of rifle barrels. Thus were born the famous Sierra bullets, which now hold many world records for accuracy. These bullets will shoot a group at 200 yards which can be covered with a penny! And today more than a million of these superaccurate pellets, in calibers from .22 to .30, are shipped to rifle shooters and loading firms each month.

Strangely, it is the little .22-caliber bullet, fired in a heavy-barrel, which has established many of the existing records at

ranges of 100 and 200 yards. With the 55-grain, .22-caliber bullet Frank Cooper, in August, 1952, shot a new world-record group at 200 yards measuring only .6378 inch for 10 shots. The 10 bullet holes could almost be covered with a dime!

Proving that such accuracy is not an accident, in the same matches 78 shooters fired 200-yard, 10-shot groups averaging only .829 inch. Mrs. Oliver Walker fired off a 10-shot group of Sierra bullets at 100 yards which measured a bare .3268 inch—practically 10 bullets in one hole!

For many years the most accurate bullets for long range shooting were of the full-jacketed type. The soft-nosed (exposed-lead point) game bullet was not believed capable of real pin-point target group shooting. But the Sierra partners, working to close tolerances in weight and calibrations, produced such a bullet.

Their bullets are rejected if they vary more than .0002 inch in diameter or more than a fifth of a grain in weight!

Superaccurate target and big-game bullets must be fired at extremely high velocity. High speed means a low trajectory curve, a "flat" bullet flight, which lessens the necessity of guessing distance and changing the rifle's sighting adjustment for different ranges. A high-speed bullet is little affected by the wind which can deflect a low-speed bullet. And in game shooting, high velocity insures hard impact upon large animals and the necessary mushrooming of the bullet to insure instant killing.

Roy Weatherby, of South Gate, Calif., with custom rifles and Sierra bullets, has had notable results in big-game hunting.

(Continued to page 230)

How a bullet is made: Left to right, copper jacket is stamped out as a cup; three stages of jacket being drawn to shape; trimmed jacket; lead core; completed bullet; two mushroomed bullets which killed big game



Camera Records "Eye Interest" of Reader for Items on Page

Researchers using an improved tool virtually look through the eyes of a reader to determine what interests him in advertising, art and reading material. Blinders or glasses cause him to move his head as he glances at different sections of a page. A small spotlight affixed to his head focuses a beam of light on a reproduction of the page just above the reading rack, in the identical area observed by the subject. A camera behind the subject, snapping at a constant speed of two frames per second, records the exact location, duration and sequence of every glance. The film is then read and analyzed. It shows time for each pause.



Tractor Shuts Itself Off If Operator Falls

Fatal accidents are prevented by a device that stops a tractor should its operator fall. It consists of a dashboard unit that is connected to the ignition wires, and a metal plug inserted in the unit to complete the circuit. The plug is attached to the driver's belt by a cord. If he falls, the plug is jerked out of the ignition circuit and the engine stops.

Pipe Lines Laid to Depth of 243 Feet Under Straits of Mackinac

Oil will be piped over four miles across the Straits of Mackinac in two newly laid lines which will rest on a bottom that dips to 243 feet below the water's surface. A barge mounting a huge winch was used to pull the pipe, supported by buoys, across the water. Both pipes will be linked to the 30-inch line being laid between Superior, Wis., and Sarnia, Ontario. This line will connect to the present one from Edmonton, Alberta, to Superior for a total distance of 1756 miles.

Chemical Stops Mold

Sorbic acid has been found effective in checking the growth of mold on foods. The fatty acid is colorless, tasteless and digestible. First application of the preservative will be to protect packaged cheese. For this purpose, the wrapper will be treated.





Miniature Air Raid Alarm

Plugged into any electric light socket, a midget air-raid and flood-warning alarm sounds a strident signal upon the lowering of the current cycle. During emergencies, power companies can alert homes and factories simply by decreasing the frequency of the current by three cycles a minute or more. Over 200 of the larger factory alarms have already been installed at the Los Alamos, N. M., atomic-bomb plant.

Pocket-Size Cutter

Suitable for opening cartons, ripping seams, trimming photographs and clipping newspaper items, a handy cutter with a single-edge razor blade can be safely carried in the pocket. The replaceable blade slides into a holder which covers edge.



Heartbeats Relayed From Jet to Ground

HIS PLANE out of control, a Navy test pilot stares half-consciously at the instrument panel as his supersonic craft dives through the purplish darkness of the upper stratosphere.

A shout in his earphones rouses him: "Wake up, you're passing out! Switch to a fresh oxygen tank!"

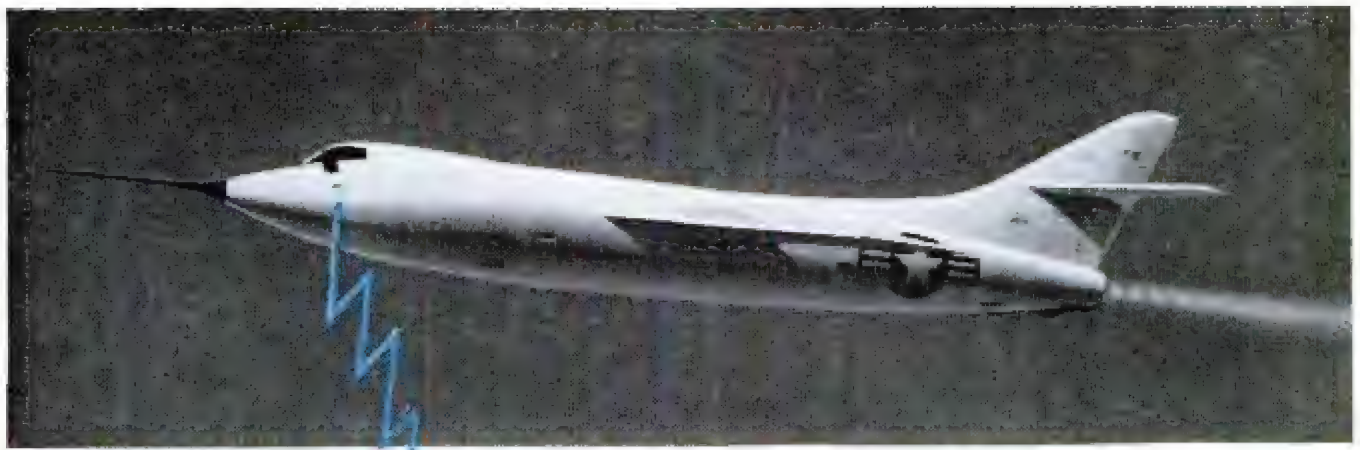
Fumbling, the pilot manages to turn on an emergency oxygen supply. His brain clearing, he pulls the needlelike ramjet-research plane out of its steep plunge. Both he and the valuable plane are saved by the ability of scientists on the ground to keep close tab of his physical and mental state.

In effect, the system lets the flight surgeon ride with the pilot in his one-man cockpit, continually checking on the man's rate and volume of breathing, his heartbeat, skin and body temperature and brain waves which tell when he is nearing an unconscious condition.

Small electrodes called transducers are taped to the pilot's forehead, neck, arms, chest and legs. When the man thinks or moves, his brain or muscles emit tiny electrical currents which are picked up by the electrodes and relayed to a small box behind the pilot's head. There they are multiplied 60,000 times and radioed to the earth by means of powerful high-frequency waves. Inked rolls of paper and oscilloscopes resembling TV picture tubes tell how the "guinea pig" is functioning.

Two years under development at the Naval Medical Research Institute at Bethesda, Md., the system has proved successful with pilots 60 miles away from the ground recording station. The higher a pilot goes, the farther the beams will reach, as the range of the wave is limited by the curvature of the earth. A pilot flying at 100,000 feet could be "watched" from 400 miles away.

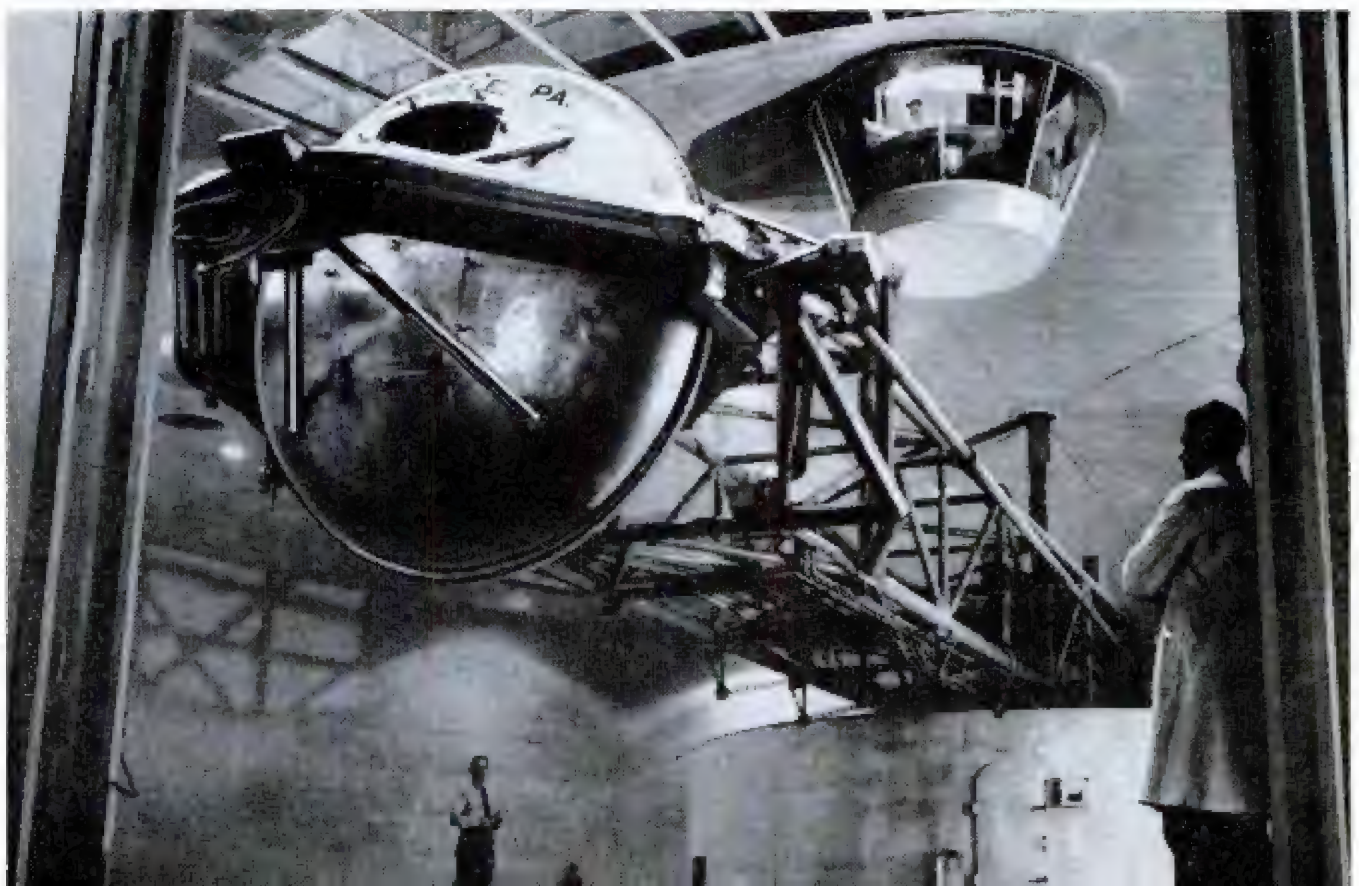
Navy flight surgeons know that a pilot fails nine times as often as an engine or an airplane in flight. If they can avert such failures and learn why they occur, months of patient research, millions of dollars, and pilots' lives will be saved. ★ ★ ★

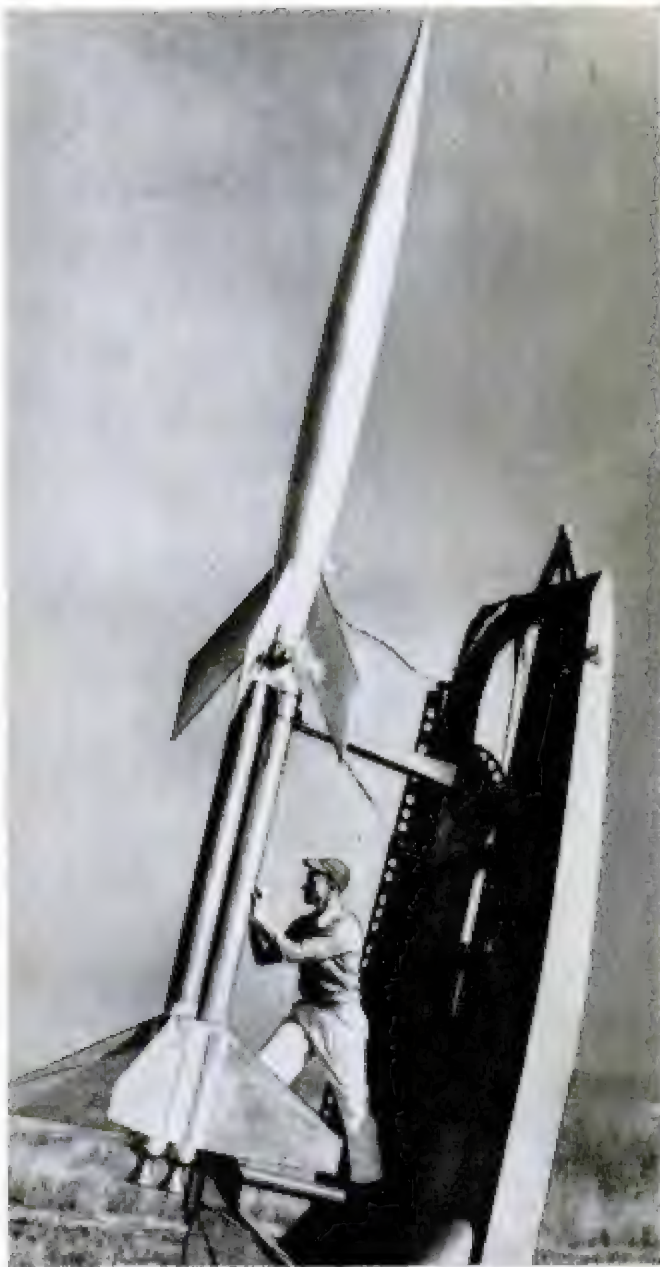


Telemeter in plane cockpit relays pilot's condition to ground. Plane above is the Skyrocket, world's fastest



Before a bank of receiving instruments, a technician examines inked graph of pilot's reactions. Beside him is an oscilloscope. At right, doctors tape electrodes to pilot's body. In pilot's lap is relay box. Below, human centrifuge previously used to test reactions of pilot under conditions similar to those of actual flight





Rocket-Powered Guided Missile Exceeds 2600 Miles Per Hour

Three rockets combine forces to give a new research missile a top speed exceeding 2600 miles per hour. Two rockets boost it to supersonic speed before a third, inside the missile, is ignited to increase the speed to four times that of sound. Tests of the 14-foot magnesium model are being made at the Pilotless Aircraft Research Station on Wallops Island, Va.

High-Riding Cyclist Runs Perilous Course

Looping the loop 140 times per minute, half of a French acrobatic team revolves on his motorcycle in a cage high above the theater stage. Meanwhile, his partner strains to support and balance the swaying load. Motorcycle, cage, pole and rider weigh 529 pounds. "The Minivers" recently appeared at the Apollo Theater in Düsseldorf, Germany, where eager news photographers lay supine on the stage to shoot good action pictures.

Vapor Can Softens Paintbrushes



Paintbrushes are kept soft and flexible in a new airtight fiber storage container. The felt liner is first soaked in a liquid solvent which evaporates in the can and dissolves the paint on stiff brushes. Up to six brushes may be hung inside the container.

Ⓔighteen times as many Americans hold civil pilot's licenses today—a total of 580,000—as were held before the start of World War II.





Portable Grain Conveyor Simply Shoves Into Bin

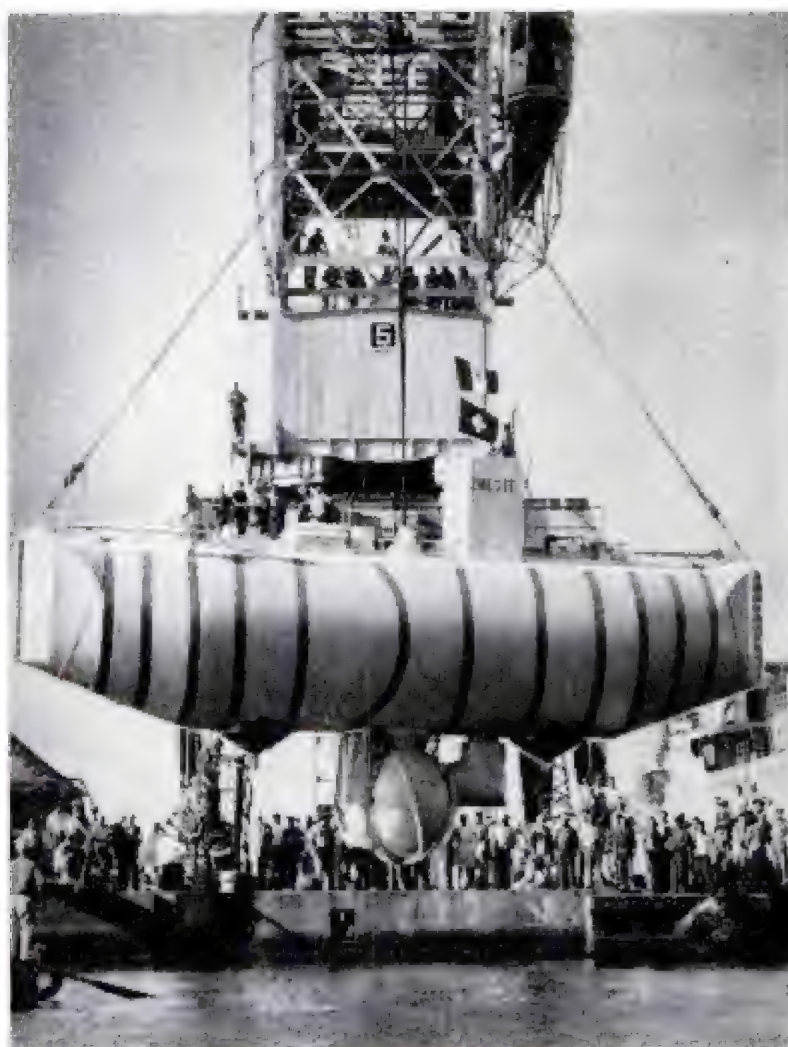
Only four inches in diameter and 11 feet long, a 24-pound grain conveyor moves 400 bushels per hour. The projecting shaft at the upper end holds a $\frac{1}{2}$ -inch electric drill which powers the auger as it pushes grain through the pipe. Designed for small jobs where a scoop shovel would otherwise be used, it is useful in moving grain from wagon box to bin, or from storage bin to wagon. Plans are to manufacture the conveyor after more on-the-farm tests are made.

Teletypewriter Reels Off 100 Words Per Minute

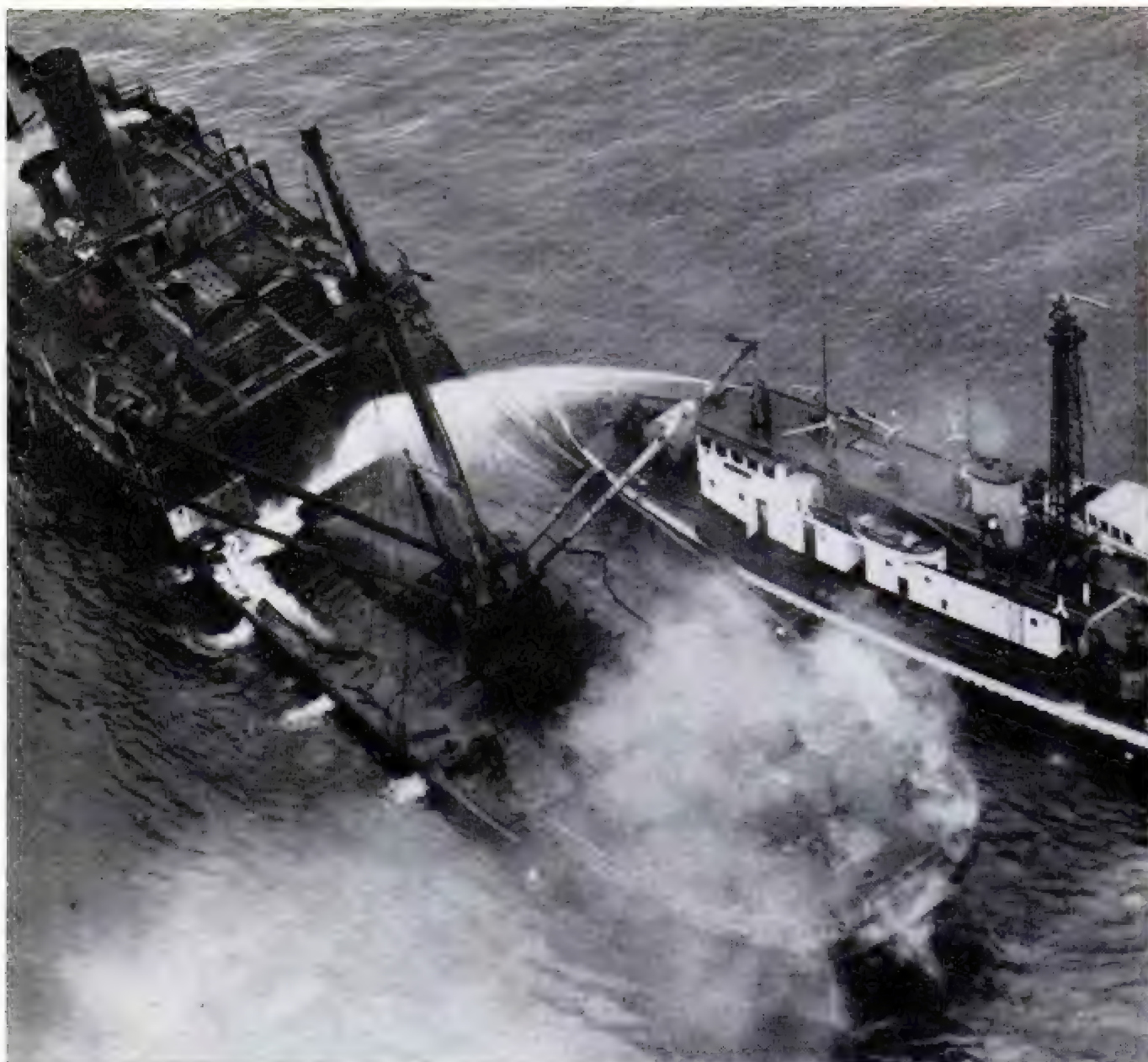
Clicking out 100 words per minute instead of 60, an improved teletypewriter will go into civilian service as soon as vital military orders are filled. The machine is quieter in operation and requires less maintenance than current machines. Type face is quickly changed and the ribbon lasts twice as long.

Piccard Bathysphere Mounts Huge Tank

Launched with the aid of a 500-ton naval crane at a shipyard near Naples, Italy, a bathysphere built for Swiss scientist August Piccard is designed to probe unexplored ocean depths. Mounted on the bathysphere is a huge, cigar-shaped section composed of water-tight compartments where a quantity of special gasoline is stored to give the craft proper buoyancy. The bathysphere itself is equipped to house the professor and his son during their observations. The unit was built especially for a descent to 13,000 feet in waters off the Italian coast. A trial descent to 3608 feet required 20 minutes.



Sources of supply for available products described in this issue are listed in the index starting on page 14. Sources of further information on other articles in the magazine are listed in the WHERE-TO-FIND-IT LIST, which is available without charge from Bureau of Information, *Popular Mechanics*, 200 East Ontario Street, Chicago 11, Illinois



New York Daily News photo

Monitor on fireboat pours a river of water aboard the SS Panuco, her hold an inferno of blazing sisal

SMOKE-EATERS WITH SEA LEGS

By Richard F. Dempewolff

THE STACCATO CLANG of a bell taps out a signal code in the offices of Engine Company 57. The fireman at the desk snaps alert and riffles quickly through a card index that tells him the exact "box" from which the alarm signal is coming. "We go!" he yells as the last tap sounds. "Box 1395, Brooklyn."

Firemen, snatching on hats and rubber coats as they run, converge on a stairway. There is a brass pole in this firehouse, but no gleaming red trucks or pumpers. This is a pier jutting into the Hudson River at the foot of Manhattan. Alongside, the "engine" sways on the swell. She looks like an over-size tugboat except for the nine big monitors mounted on her superstructure like

antiaircraft guns, and the spiring water-tower. As the men scramble aboard, lines already are being cast off. Seconds later the mighty *Fire Fighter*, claimed to be the most powerful fireboat afloat today, noses into the river on another mission.

No one ever knows what kind of job will be waiting. It may be a vast waterfront fire, like the Staten Island ferry terminal blaze a few years ago that consumed acres of buildings; a supercatastrophe, like the Black Tom explosion; a blazing oil tanker drifting toward a pier laden with explosives; or perhaps a helicopter pilot has dunked in the river, a boat is adrift, or someone has fallen off a ferryboat. It's all in a day's work for the men of the Marine

Division, New York City Fire Department.

"It may not sound so tough," Marine Division Chief John Holian will tell you, "until you know that the port of New York consists of eight bays, four rivers, four straits and 578 miles of shoreline—most of it highly combustible. There are some 720 piers for major ships, constantly heaped with explosives, gasoline, ammunition and flammable sisal for making rope. The shores are lined with petroleum farms, refineries and warehouses. That doesn't count the Jersey coast, which we help protect."

More than 10,000 big ships came and left the harbor last year, bringing in about \$6,-500,000,000 worth of cargoes. So the security maintained by the city's Marine Division affects the entire world.

To protect this potential pyre from the carelessness of its own makers takes the combined efforts of 10 marine companies under Chiefs Holian, Martin Carrig and George Carlen. Between them and nine big fireboats, they can muster the fighting power of 150 land companies, plus numerous hook-and-ladder and rescue units. And soon they'll be doing better.

Right now, on the ways of the John H. Mathis shipyards in Camden, N. J., a sleek 129-foot hull of welded steel is taking shape. Designed by naval architect John H. Wells, under the close supervision of New

Fire Fighter has launch to carry hose between boat and fiery pier



Bow pipe is an artillery piece that shoots water

20,000 gallons of water per minute shoot from monitors and rail pipes as Fire Fighter greets incoming vessel

N. Y. Fire Department photos by Hellriegel and Heffernan



York fire commissioner Jacob Grumet, fire chief Peter Loftus and public works commissioner F. H. Zurmuhlen, the tough new \$1,426,053 fireboat will contain every device and improvement that modern marine fire-fighting techniques and shipbuilding science can put in her.

Four separate diesel power plants, whipping up a total of 4000 horsepower, will propel her and drive her pumps simultaneously. This means that while her four massive centrifugal pumps are shoving a Niagara of 14,000 to 18,000 gallons of water per minute, at 150 pounds pressure, through her six deck monitors and 16 hose connections, the other set can spin the twin screws that send her along at a 16-mile-per-hour clip. "Anything faster," the men explain, "would create a wash capable of doing as much damage to some waterfront structures as a fire."

The new fireboat's twin screws will be raised up inside a unique tunnel in her stern, above the craft's nine-foot shoal draft. Hence she will coast easily around the city's shallow bay waters without danger of banging up the propellers on submerged rocks or debris. What's more, if she should go aground she'll still have power to pull herself free.

Besides her six big monitors, the new vessel's topside armament will include a 53-foot tower strategically located forward instead of aft of the stack. Radar will guide her in bad weather. Her blunt seagoing hull will enable her to go out to ships afire

on the ocean and to nudge ships away from burning piers. And down in her hold there will be tiers of special beds for fire victims.

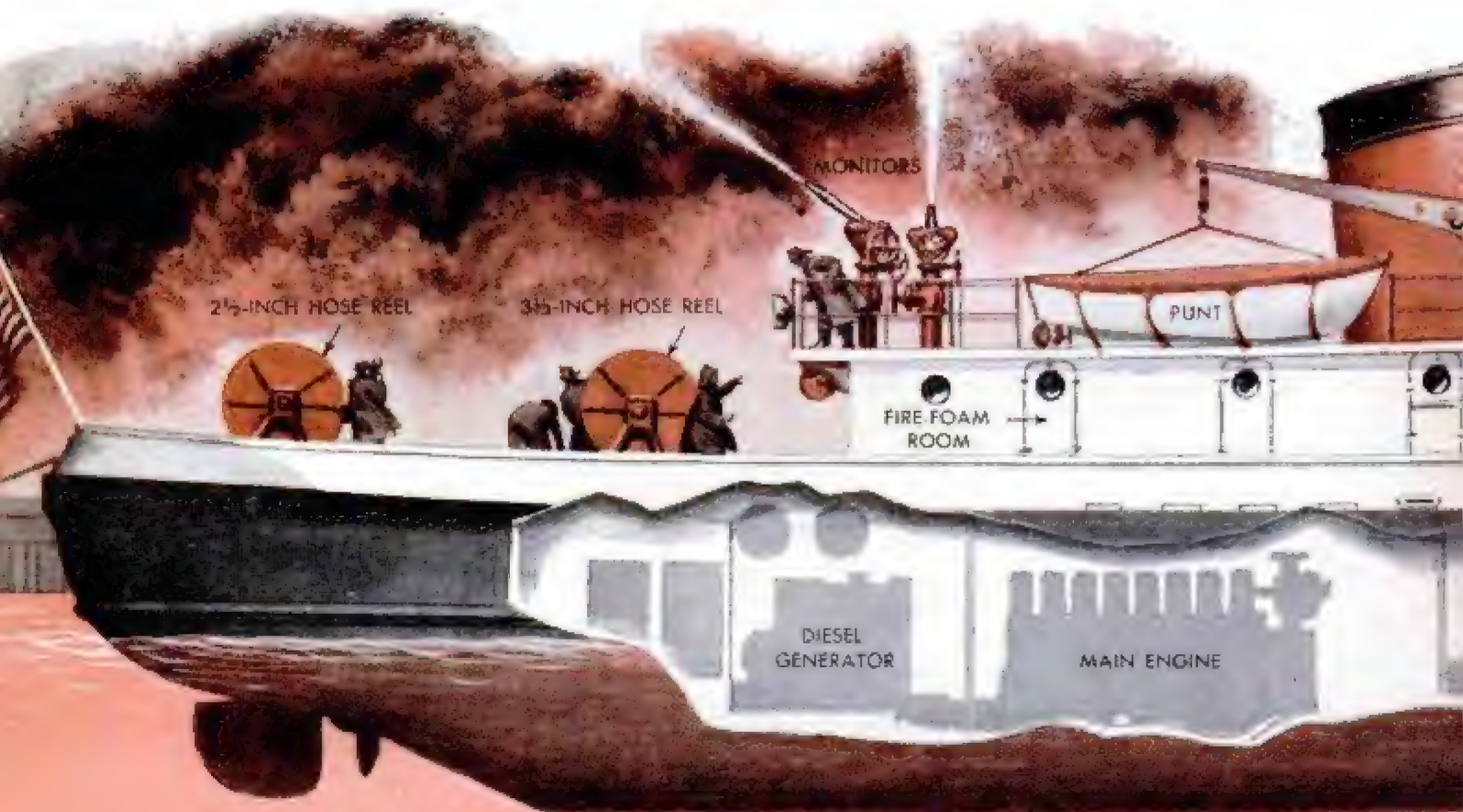
The team that this superseagoing fire engine will join is a smooth, grimly efficient little navy. In the gloomy recesses of Pier One where Chiefs Holian, Carrig and Carlen direct their tactical wars against fire, you can see how it works. Each fireboat has its own berth—strategically spotted at some distant pier on the vast waterfront. Each guards a separate section of harbor, responding to alarms pulled in that territory. The 132-foot *Fire Fighter*, 14-year-old queen of the fleet, is berthed at Pier One, for instance. Her territory includes all of lower New York, near-by New Jersey, Staten Island and parts of Brooklyn. Each crew shift, manning her around the clock, includes six firemen, one officer, three engineers (all of them trained firemen) and a pilot.

"We don't always wait for alarms," Chief Holian explains. "When an oil storage plant in Hoboken blew up recently, we saw the explosion and took off. The alarm came through when we were half way across the river. Frequently we see river boats in trouble and go to their rescue."

But most often it's the tapping bell that sends the men running. Last year the *Fire Fighter* made 200 runs, of which 72 were false alarms—nine of them listed in the log as malicious.

When that bell taps out a *Fire Fighter* box number, Pier One explodes with ac-

New fireboat will have six big monitors, a 53-foot tower and radar for navigation during foul weather



tivity. Within minutes (180 seconds is her best get-away time) lines are cast off and the big boat is moving. Down on the stern deck, rubber-coated men break out hose in 50-foot lengths. Ends are hitched to an array of 24 hydrants that project from two manifold hubs jutting up through rear-deck plates. Down in her engine room, powerful pumping engines are being warmed, ready to roar up the power that will send 20,000 gallons of water per minute at 150 pounds pressure gushing from her monitors.

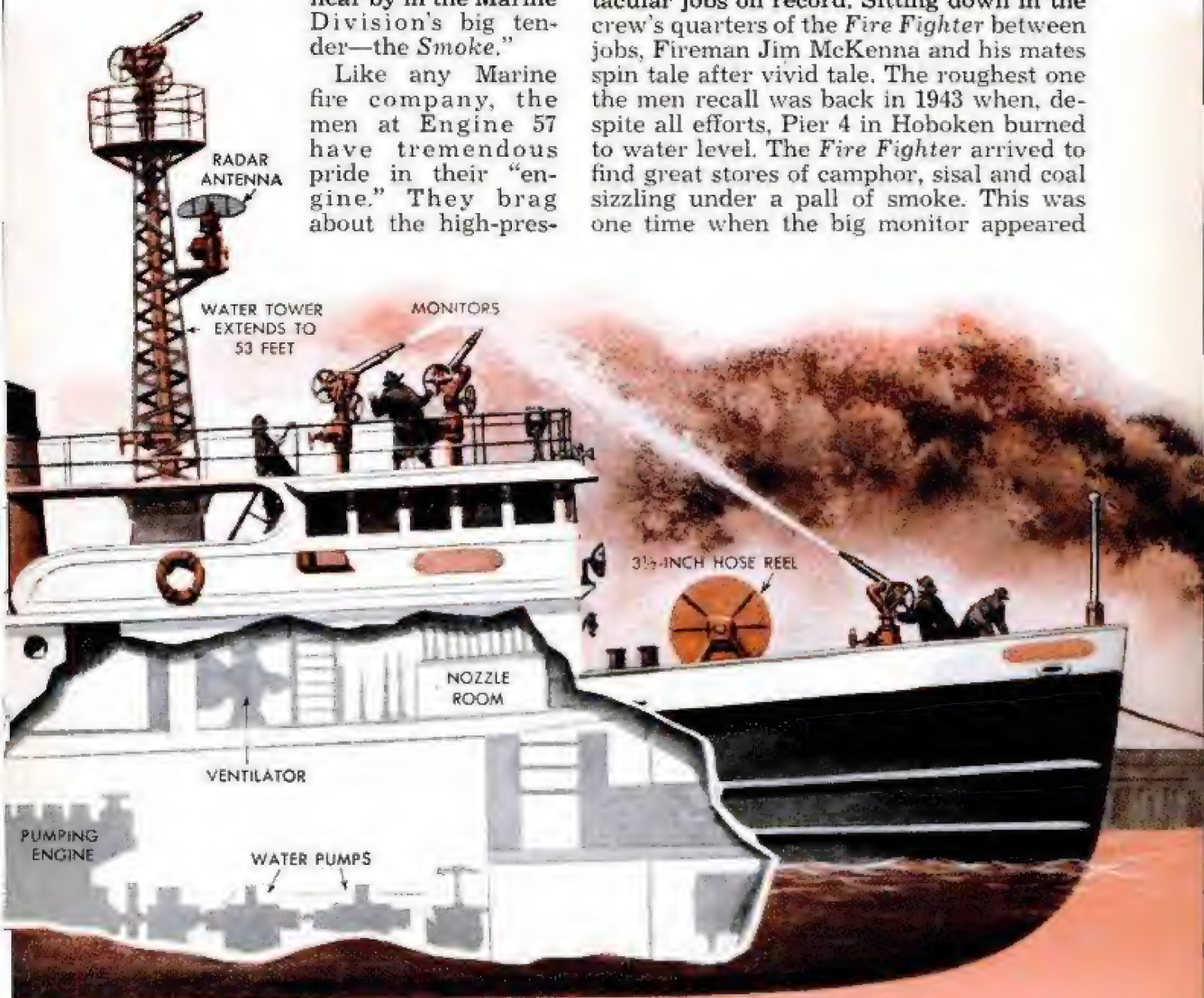
Up in the pilothouse, the lieutenant is making contact with headquarters on the short-wave radio system. Over this radio net, strategies are worked out while fire fighting is in actual progress. "Suppose," says Lieutenant Albertella, "we have a pier fire that's too big for us. A call to headquarters will bring more boats on the run. With his radio, the lieutenant can maintain constant contact with his division chief—whether the chief is back at headquarters, or circling near by in the Marine Division's big tender—the *Smoke*."

Like any Marine fire company, the men at Engine 57 have tremendous pride in their "engine." They brag about the high-pres-

sure output of her monitors. It's something to brag about.

Shooting 8000 gallons per minute at full 300-pound pressure, the big five-inch bow pipe alone recently punched a huge hole through the 14-inch poured-concrete wall of a pier. It can send a pier roof flying. Last year, the fireboats fought a stupendous blaze in the Brooklyn coal docks. In three hours, one pier was nothing but a charred pile of steel beams, massive timbers, twisted steel sheets and crumpled heaps of smoking debris. Wrecking companies estimated two weeks to clear the mess from the concrete base of the pier. The *Fire Fighter* moved alongside and opened her bow pipe full blast. "Twelve by twelve timbers flew through the air like matchsticks," the men recall. "Steel beams and sheets flipped end over end into the water." In three hours, the pier base was clean as a whistle.

Piers laden with everything from chemicals to TNT, have provided New York's fireboat crews with some of the most spectacular jobs on record. Sitting down in the crew's quarters of the *Fire Fighter* between jobs, Fireman Jim McKenna and his mates spin tale after vivid tale. The roughest one the men recall was back in 1943 when, despite all efforts, Pier 4 in Hoboken burned to water level. The *Fire Fighter* arrived to find great stores of camphor, sisal and coal sizzling under a pall of smoke. This was one time when the big monitor appeared





N. Y. Fire Department photo

Fireboats and tugs work side by side to keep a burning ship in position while they pour water aboard

to do too good a job. One blast and the pier wall ripped wide open. Out poured billows of smoke, blinding everyone on board. Crew after crew went down. One gang would be carried away while another took its place at the monitors. "Every man in Engine 57 wound up with conjunctivitis from that feed," McKenna recalls.

Pier fires, like the Grace Line blaze that

Hydrant outlets—24 of them—jut from two huge manifolds aboard the Fire Fighter. Men connect 2½-inch hose to fight pier fire



made headlines a couple of years ago, have a nasty habit of creeping along through the creosote and oil-soaked piling under the concrete floor and bursting out in new places. To get at these "creepers," the men use special equipment and techniques. Wearing their masks and air bottles, two or three firemen invade the burning structure. Hose is stretched in by one man ahead

of the others—to clear the way. Another carries one of the fireboat's pneumatic chisels. With it he will chew a series of holes through the concrete floor. From the boat's "gold room" up under the pilothouse, which contains a glittering array of polished brass nozzles, a "distributor" nozzle is selected for the job. This gadget, which comes in several huge sizes and types—including one designed by Chief Holian—works like an overgrown lawn sprinkler. Attached to the end of the hose, it is poked through the hole nearest the underpier blaze and set swirling, scattering thousands of gallons of water.

When this doesn't work—as it didn't at Grace Line's pier—the men break out their punts. Each fireboat has one of these heavy wooden bathtub-shaped boats lashed to her deck. The craft are jet propelled. A porta-

ble pump is loaded aboard. The water it sucks from the river is spewed out at 100 gallons per minute through two nozzles held by the fireman. By directing one stream over the stern, he can force the punt ahead and steer it through the smoke between the pilings until things get hot. Once there, he can hold position and turn his other portable stream on the blaze. These baby fireboats are also used for "stretching" hose across open water between the fireboat and a burning pier. But they're not too popular with the men. "It's rough duty," one of them points out, "when you've got five inches of ice water in the bottom on a freezing night and the back pressure is shoving you around like a crazy waterbug beneath a burning pier. If that's not enough, there's always the chance that pilings are so far gone a whole section may collapse on you."

Heroes come by the gross in this business, and the *Fire Fighter* has had her share. At this same Grace Line pier fire, she was tied up to a stringpiece to hold her close, against the back pressure of her roaring monitors. Suddenly the entire 1000-foot stringpiece burned loose and swayed toward the boat. In the face of being crushed to death, Fireman Peter McNulty leaped to the cracking timbers and raced to loosen the lines that held the boat fast in the fatal trap. He had just heaved

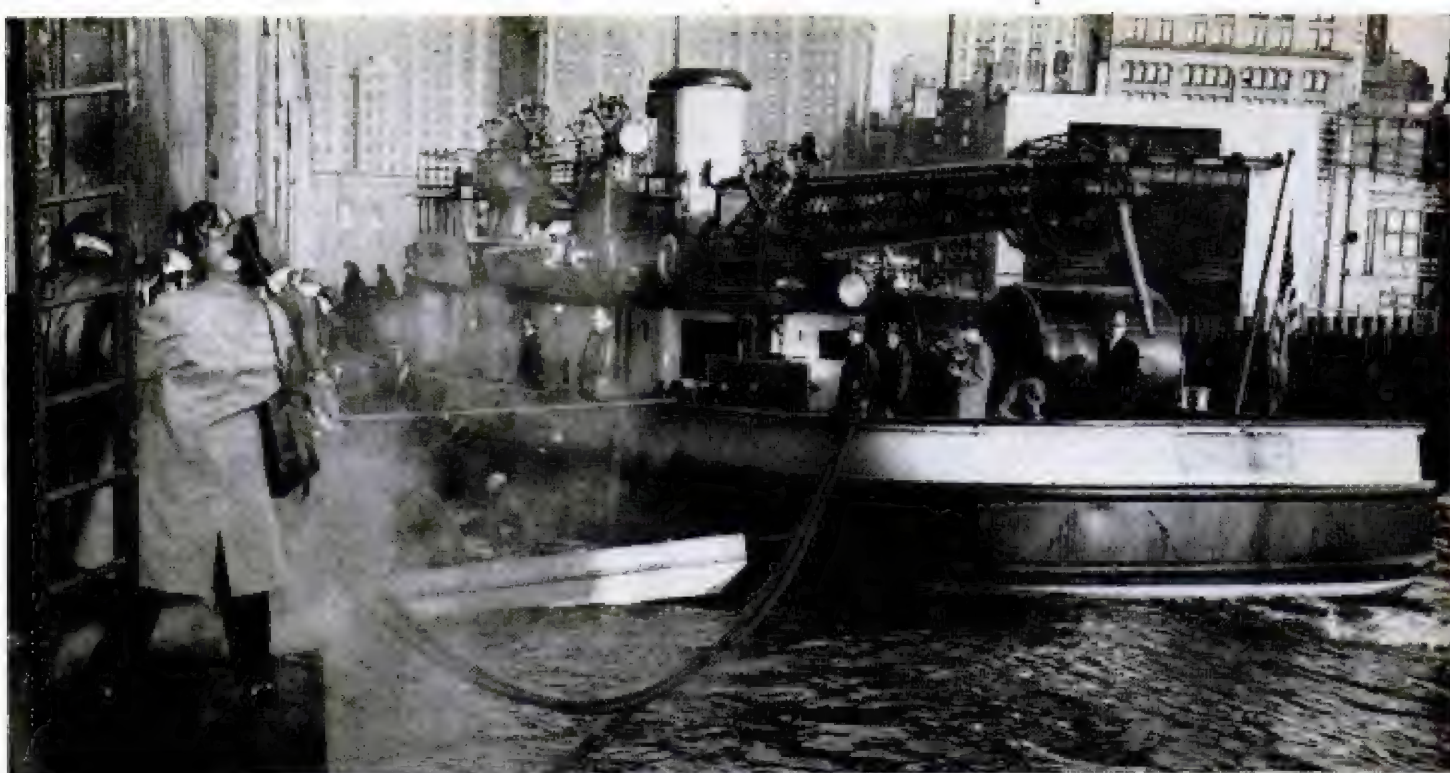
the last rope free and watched the *Fire Fighter* back off to safety when the massive stringpiece crashed over—taking him with it. Two buddies, Joe Evans and George Wissing, fished him out from under the broken timbers.

It wasn't the *Fire Fighter's* first threat of being squashed into the harbor bottom. The great *Normandie* almost sat on her, too. "We poured so much water in that ship to douse the fire in her," McKenna recalls, "that she developed a list. Then the tide went out. Pressure from the monitors on our boats had shoved her tight against the pier. She came down on the undredged edge of her berth and slowly tipped over on the *Fire Fighter*. We knew she was coming and we were ready, but for a minute we were snagged, while our crews whipped up full power and all hoses were cut. Then, suddenly, part of our snagged bow snapped off, and we popped out from under the burning liner just as she rolled over."

You can see the need for the rugged tugboat-type construction of these boats as the men tell tales of the pounding they take. In 1902, the *William L. Strong*—an old coal-burning fireboat that the new one will replace—was fighting a catwalk fire on the towering Williamsburg Bridge when the whole walk cascaded into the water, missing her by inches and flipping her up on

Land engines and a fireboat form an efficient team to fight a smoky naphthalene fire on a pier in Brooklyn
N. Y. Fire Department photo





N. Y. Fire Department photos

Man in punt has already stretched line from boat to blazing pier. Now he heads underneath to check pilings

her beam end. The same boat shuddered under the explosion of a heavy-caliber shell that went through her stack when she was fighting the Black Tom explosion fire in 1928. Another fireboat, the *Thomas Willett*, narrowly escaped a watery end while attempting to drown a fire on a freighter, discharging nitrate and canaries at a pier. "Suddenly the nitrate let go with a wham that tore the ship apart," the boys recall.

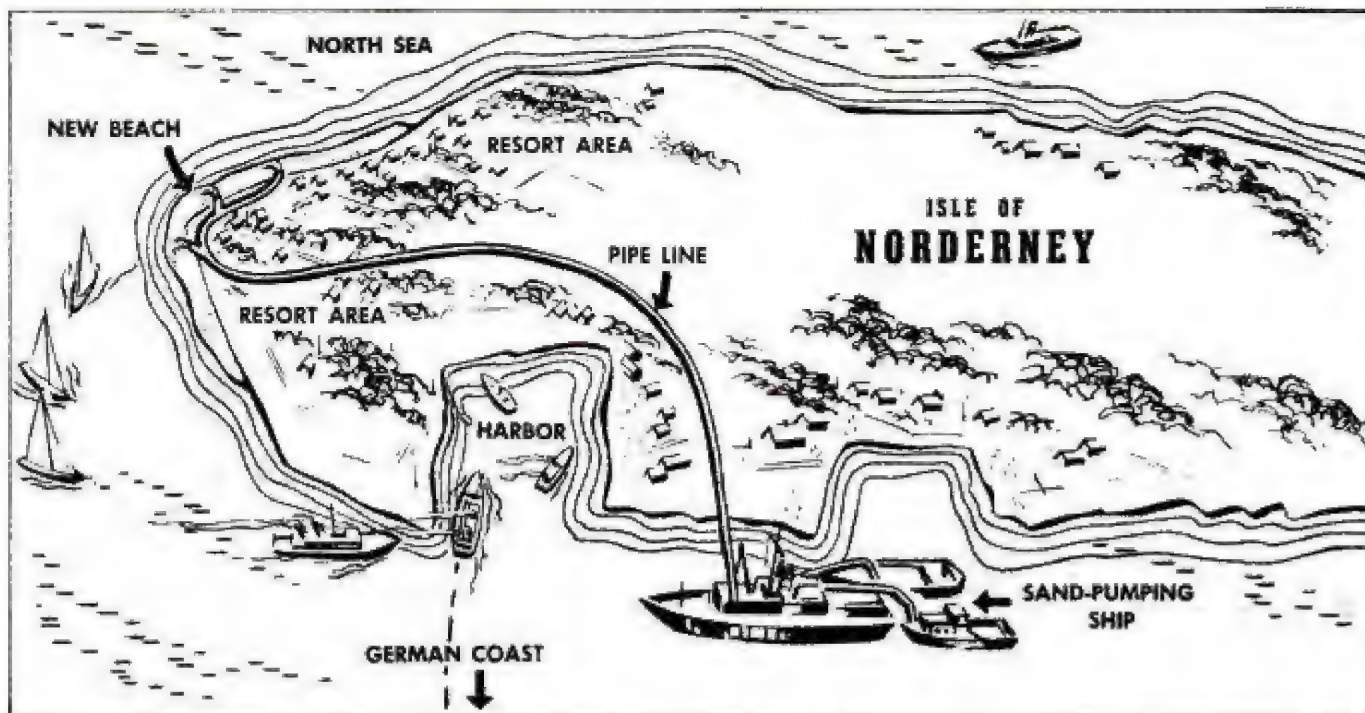
Fighting a fire in a forest of blazing pilings is close, dangerous work. Men sometimes power and guide the boat with stream from a hose



"A half-ton hatch cover soared through the air, whacked into the *Willett's* pilot-house, carried it away with one swipe and killed Pilot John J. Harvey. Two men were blown overboard. The explosion blew a hole in the water right under the *Willett*. She dropped 10 feet. Water closed over her, but she surfaced like a tough old whale, spilling water from every cranny."

There are plenty of times when fireboats must perform actual tug duty. For instance, when the SS *Panuco* was unloading sisal at barge-crowded Pier 26 in Brooklyn recently, someone dropped a lighted match in the excelsiorlike material. Whoom! Within seconds fire raced through the sisal from pier to ship, zipping down into the hold. A minute later it had jumped from barge to barge and two adjoining piers were ablaze. Flames traveled so fast that 45 able and lively men working on the sisal couldn't get out of the way in time. When the *Fire Fighter* moved into this mess, three piers were burning, the *Panuco* was a holocaust and 20 burning barges were drifting loose, carrying the fire all over the harbor. The big fireboat had to tie on to the burning *Panuco*, haul her white-hot hulk to open water and pull out her anchor from the side. Then the fireboat rounded up the blazing barges,

(Continued to page 266)



Underwater sand is pumped into barge beside ship, mixed with water, and piped across island to new beach

Piped-In Sand Forms New Beach

After a tidal wave swept away the sand from a resort beach on the northwest coast of Norderney Isle early this year, sand from the opposite side of the island was pumped across land to re-cover the beach. Pure sand underlies the shallow strait separating the island from the German coast. So shallow is the strait that the ebb tide has been known to leave the sand flats exposed at certain times creating a dry footpath to the mainland. Pumps mounted on a steamer in the strait sucked up sand which was deposited in a barge alongside the ship. There the sand was mixed with water and the resulting mixture was forced through a pipe line that stretched the width of the island. The pipe line ended in several "mouths" which poured the slurry along the shore.



Above, sand-pumping ship. Pipe at left carries sand to shore. Barge is behind ship. Below, sand pouring from pipe line onto rebuilt beach



"Jammer" Sends Messages While Interfering With Enemy Reception

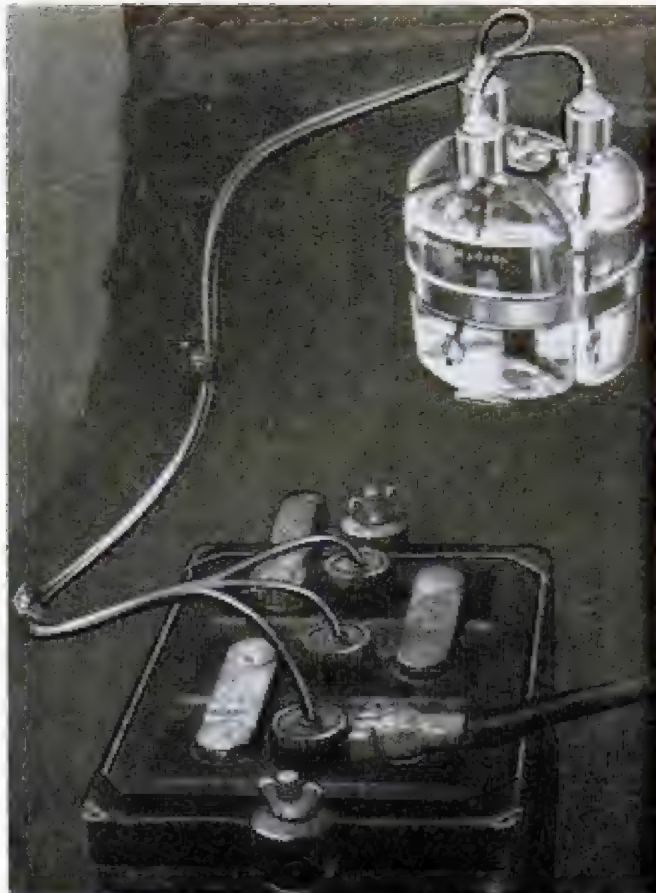
During World War II, radio messages were sent by a secret method that eliminated enemy interception. The method was revealed recently when the inventor was granted a patent. The system fooled the enemy by making him believe the transmission was for the purpose of jamming his

own radio signals. Two transmitters and two receivers are used. One transmitter sends out a jamming pulse at regular intervals, and the other sends part of a message between the pulses. One receiver hears the jamming pulse and utilizes it to trigger the other receiver into operation.



Silicone-Water Mixture Seals Masonry Walls

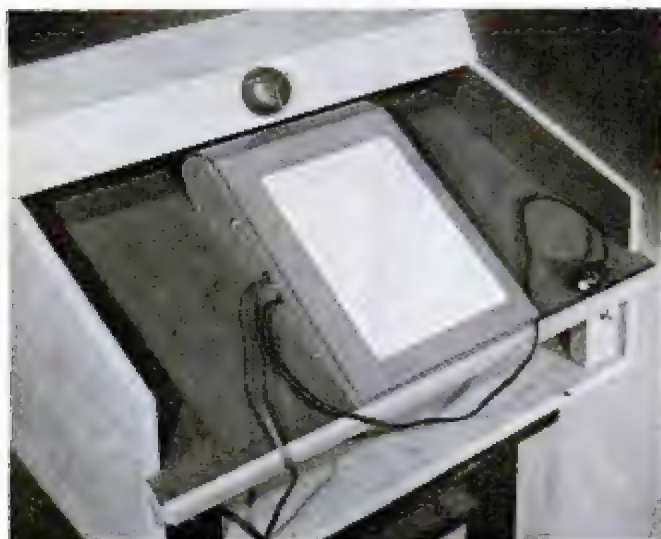
Walls made of stucco, concrete or brick will repel water when treated with a new silicone solution. The silicone is available in concentrated form which is mixed with seven parts of water. When this is applied to the wall with spray or brush, it reacts chemically with the water-soluble compounds in the masonry to make the wall water-repellent. It thereby protects against staining, rust streaks, dirt and efflorescence (the white "salts" that appear on many masonry walls). The silicone-treated surface can be painted with oil or water-based stucco paints if desired.



Nested Water Bottles Fill Battery Automatically

Three nesting bottles mounted under the hood keep automobile batteries supplied with water automatically. The water is carried to the battery cells through three plastic hoses, one for each cell. The bottles can be mounted anywhere in the engine compartment, either above or below battery level. Heat from the engine expands the air in the bottles, forcing water into the cells and keeping it at the proper level. A slight transfer of battery water back into the bottles results when the engine cools. This acid prevents the water from freezing, according to the manufacturer.

Portable Manuscript Holder Shifts Pages for Speaker



There's no shuffling of the script when your prepared speech is held by a portable electric device. A continuous sheet of paper feeds from a roller at the bottom to one at the top. A control button on the end of a two-foot cord regulates advance of the script. When you near the bottom of a page, you press the button and a new section appears along with the last few lines of the preceding page.

Ground-up nut shells and fruit pits serve as anti-skid agents in car tires, "fillers" in fine plastics, litters for poultry-house floors and blasting grits for cleaning airplane-engine parts.

TRANSMITTER-RECEIVER

ANTENNA IN CASE

BATTERY

SIGNALS RECEIVED ON BEACON SCREEN

1. SIGNAL PICKED UP
2. STRONG HOMING PHASE
3. VOICE SIGNAL
4. BEACON ON LISTEN
5. VOICE FROM STARBOARD
6. AIRCRAFT OVERHEAD

WEIGHTS ATTACHED JUST OVER THREE POUNDS

BATTERY UNIT CARRIED IN UNDERARM POCKET OF LIFE JACKET

BEACON EQUIPMENT (TRANSMITTER-RECEIVER) CARRIED IN AIRCRAFT WEIGHS ONLY 10 POUNDS

CONNECTOR FOR SWITCH UNIT

WIRE

SIGNAL TRANSMITTER

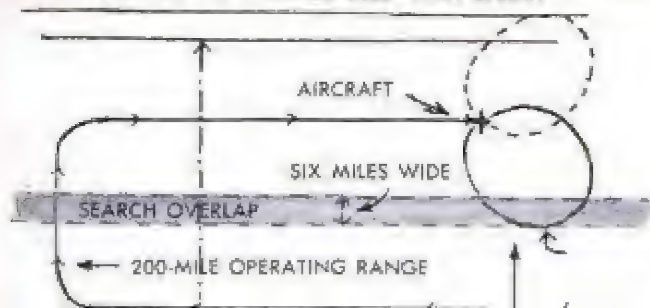
BRITAIN'S SARAH USES TELEVISION TO RESCUE DOWNED AIRMEN

FLEXIBLE METAL-TAPE ANTENNA 31 INCHES LONG

ANTENNA AUTOMATICALLY ERECTS ITSELF WHEN COVER IS REMOVED

ANTENNA CASE ATTACHED TO LIFE JACKET

TYPICAL SEARCH COURSE USED WITH SARAH



SPEECH UNIT, USED ONLY WHEN RESCUE AIRCRAFT IS SIGHTED, HAS SIX-MILE RANGE

SPEECH UNIT

RECEIVING SWITCH

SPEAKING SWITCH



WHAT'S NEW FOR

Your Home

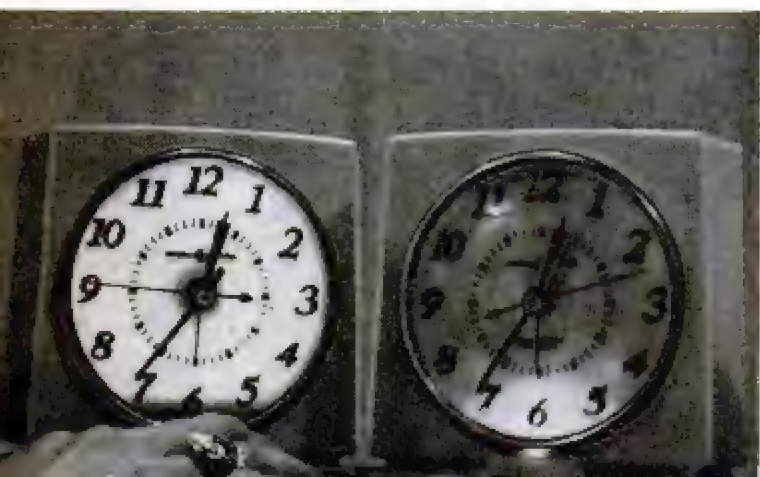
ISLAND SINK for large kitchens is only a few steps away from wall cabinets, refrigerator and dinette. Drainboard running the full length of sink provides abundant working space. Below are roomy cabinets. Built-in outlets permit use of appliances

FOLDING WARDROBE RACK holds two or three hats and six coats. When not in use, it folds into a wall fixture only $3\frac{3}{4}$ inches thick. Neat and compact, the rack leaves floor open for easy cleaning, is suited to entrance halls, bedrooms and waiting rooms



"COLD LIGHT," lower left, illumines clockface evenly, at cost of half cent a year. Clock at right is unevenly lighted by one-watt bulb at 50 times that cost. Cold light results when electric current is applied to phosphor painted on conducting glass

HOT-ROLL CUTTER, below, ends shaping of spiral and multileaf rolls by hand. Spiral blade for making pinwheel rolls is on one side and four blades to make four and eight-leaf rolls on other. Cutter is dipped in melted butter before it is used to separate dough





WALL CABINET expands into a full-size dining table by means of drop-leaf panels supported by leg frames which swing out from cabinet. Half of one leaf can be used alone as a card table or writing desk. Cabinet has drawers and shelves for storage



COMBINATION LADDER, right, can be used as a stepladder, a flat-step extension ladder, a stairway ladder for various-pitch stairways, or as separate straight ladders. Shipped unassembled, ladder is quickly put together in any of various combinations



MIDRANGE GRIDDLE in both gas and electric models serves as grill or warming plate, or can be removed to expose a giant seven-heat cooking unit for kettles up to 25 quarts. Cover folds down flush with work top, when upright serves as a splasher back



"Hot Gun" Porcelainizes Surfaces of Bridges and Buildings



Bridges, buildings and even ocean vessels will be coated with porcelain after they're built if a new spray gun comes into wide use. The gun shoots porcelain material through an acetylene torch and fuses it to steel. The torch preheats the steel surface and then shoots the porcelain material from tiny holes around the nozzle through the 1600-degree flame to melt it. The glasslike surface of the porcelain coating prevents corrosion, simplifies maintenance and is designed to provide long-lasting protection.

Portable Service Stations Maintain Company Fleet

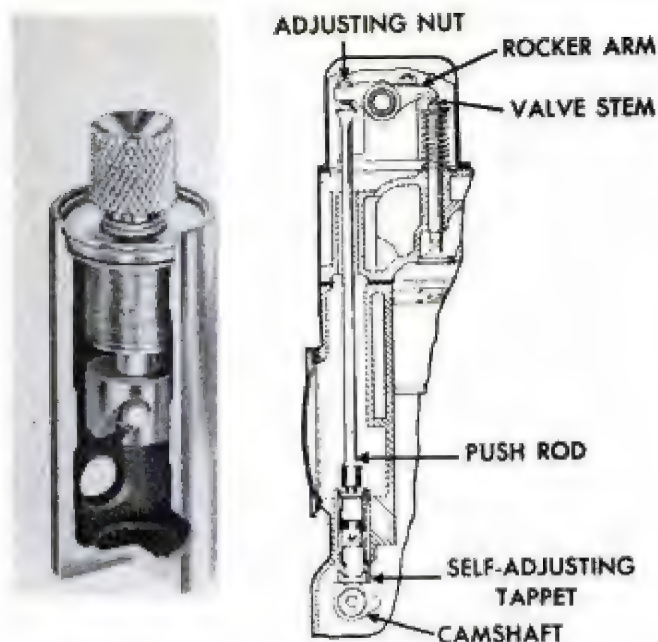
Cars, trucks and buses numbering in the hundreds are serviced in parking lots at Douglas Aircraft plants by traveling service stations. Each motor-driven unit carries 200 gallons of gasoline, 50 quarts of oil, a large tank of water and an air compressor. One man now services an entire fleet.

Wheeled unit provides water for radiators, right, and air for tires, below, plus gas and oil



Chicken Sex Determiner

With a new electrical instrument developed in Japan, the sex of as many as 150 chickens can be determined within an hour. Chicken-sex determination has long been a monopoly of the Japanese, but the machine's results are said to be more accurate than those of human experts. More than 500 of the mechanical units have already been exported to the United States.



Self-Adjusting Tappets

Proper valve timing is maintained over thousands of miles of hard driving by self-adjusting tappets that react to temperature changes as well as wear. An internal-tension control automatically adjusts at every piston stroke to variations in the length of the valve-mechanism system. The tappets compensate for expansion and lengthening of the system at high engine heat and for contraction and shortening when the engine is cold.



Spark-Plug Tester

Spark plugs covered by protective rubber boots are quickly checked with an improved indicator that has a needle probe to perforate the insulation. The probe is withdrawn inside a metal sheath when not in use. The neon tube of the indicator responds to the high voltage and its brightness indicates the condition of the ignition system.

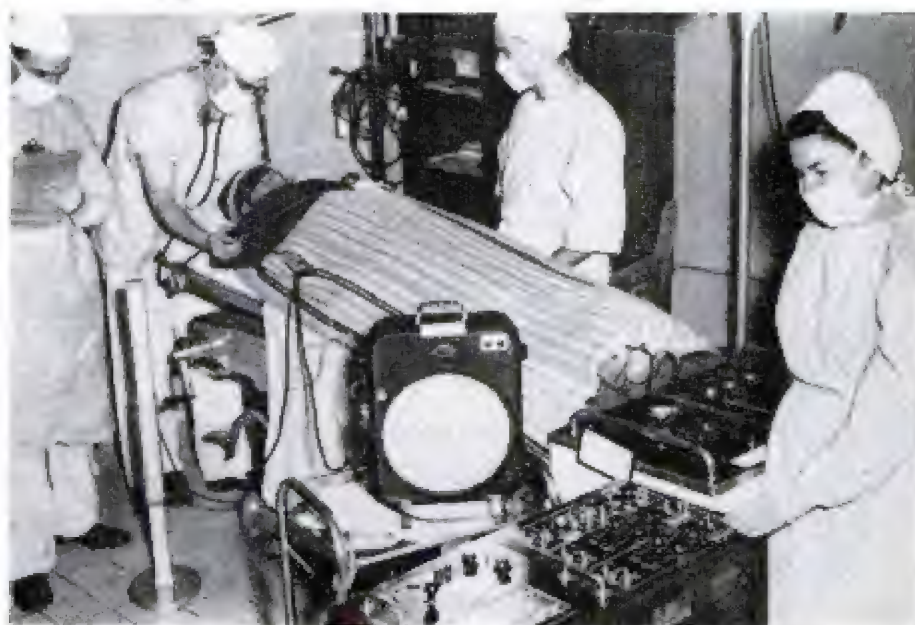
Gamma Rays Used for Food Preservation Also Destroy Vitamins

Atomic rays used for food sterilization not only kill harmful bacteria but also destroy necessary vitamins, three Columbia University researchers report in the *Journal of Agricultural and Food Chemistry*. It has been proposed that gamma rays be

used to kill bacteria that cause food spoilage, making it possible to keep food indefinitely without canning it. Research on milk indicates that 70 percent of the vitamin A in raw whole milk is destroyed by a six-hour exposure to gamma radiation.

Refrigeration Blanket Cools Surgical Patient to 80 Degrees

Another milestone in medicine was marked by a recent heart operation in which body temperature of the patient was lowered to 80 degrees. A refrigeration blanket cooled the patient while an electric recording thermometer kept careful track of temperature. Although normally it is impossible to stop the flow of blood through the heart for more than two or three minutes, in the 80-degree state it may be excluded from the circulatory system much longer.





While Louis Brown dresses a mooseskin, Norman Mervyn wields an axe to shape the canoe's skeleton



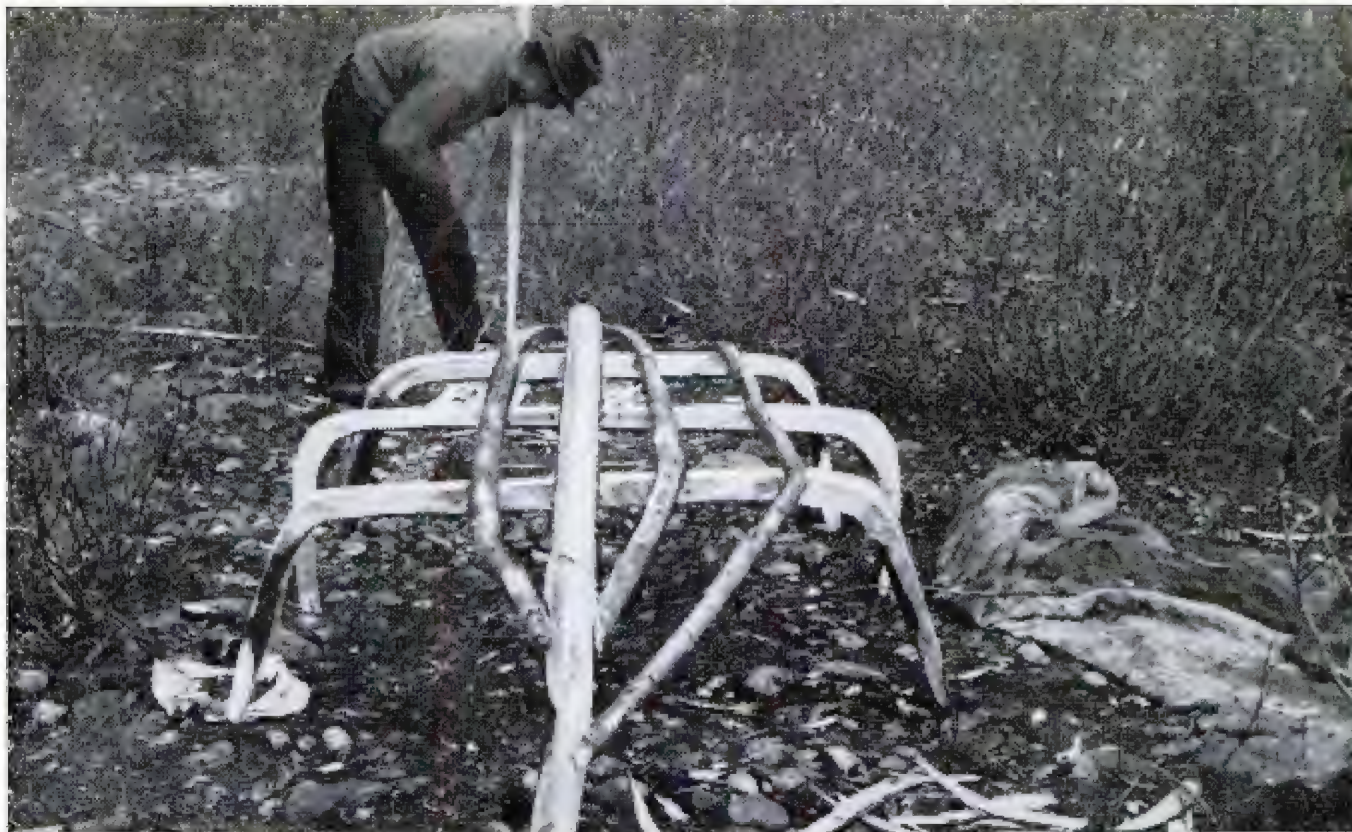
In a race against an early freeze-up as an arctic winter approached, these hunters took what nature offered and built their own escape boat—a

MOOSEHIDE CANOE

By F. Wallace Taber

Spruce roots cannot penetrate the frozen earth deeply, so they lateral out, forming perfect canoe ribs





With the ribs notched, wedged and pinned into place, they are next tied with strips of moosehide and further secured in position with the handful of nails that were available. Both guides were experienced in the lore of the wilderness country

With the ribs spaced to utilize the full width of the available mooseskin, the precious nails were distributed sparingly to provide a rigid bond between the canoe's ribs and keel

IMAGINE YOURSELF 500 miles from your jumping-off spot. You're in the very heart of the uncharted wilderness that is the northern Yukon territory of Canada. Shore ice is forming fast. It will soon meet in the middle of the river and seal your last retreat route back to civilization.

The bogs and muskegs, too, are freezing each night, thick enough that, loaded down, your pack horses break through and cut their legs on the jagged ice. Unloaded, they can remain on top, make good time, and probably beat winter back to civilization.

You're faced with the plight of leaving much of your supplies and all of the near-record trophies you've labored for nearly 90 days to amass. Neither you nor your Indian guides had reckoned on such an unseasonably early winter. One day it was fall. The next, bleak winter. You must get out fast. But how?

This is the plight that faced big-game hunter Jim Bond who, when not hunting, operates a pair of grocery stores in the state of Washington.

After the full realization of their plight had registered, Bond and guides Norman Mervyn and Louis Brown lost no time reverting to the lore that makes the vast Yukon wilderness a year-round home to





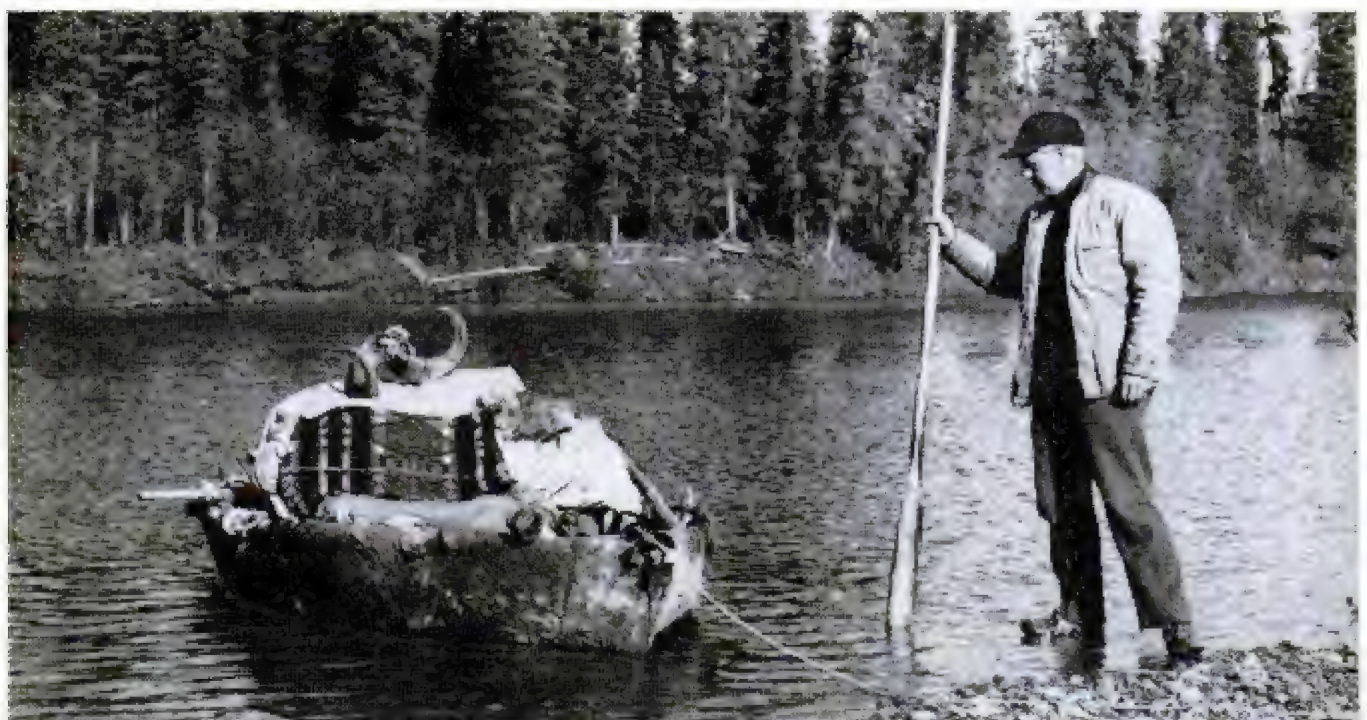
the Indian. They built a moosehide canoe, using only the materials nature provided, plus a scant handful of nails they were fortunate enough to find in the duffel. They loaded the canoe with the bag and trophies and began drifting. First, Mervyn and Bond went down the Beaver, a tributary, and then down the Stewart.

Meanwhile, relieved of their loads, the horses struck back overland 500 miles to Mayo under Brown's guidance.

Ten days later, with provisions two days gone, Mervyn and Bond floated into the docks at Mayo, their wilderness-made canoe still afloat with her prized cargo. The next day, Brown arrived with the string of horses, cut and bruised, but alive. The following day, the Stewart was frozen tight. The escape route was shut off. But the hardy trio had made it with one night to spare. ★ ★ ★



Framework completed, upper left, the green mooseskin is pulled and stretched into place. Whittling a paddle from dried spruce, left, is the last labor. Below, with the cargo lashed down, the canoe is ready for flight before winter freezes the rivers





Wheeled Snow Shovel

Shoveling snow isn't such a task with a new shovel that is never lifted off the ground. Two wheels tilt the device at a good scraping angle as it is pushed along the sidewalk. The operator tosses the snow to either side by depressing one of two hand-operated levers.



Auto-Bumper Plows Clear Wheel Paths

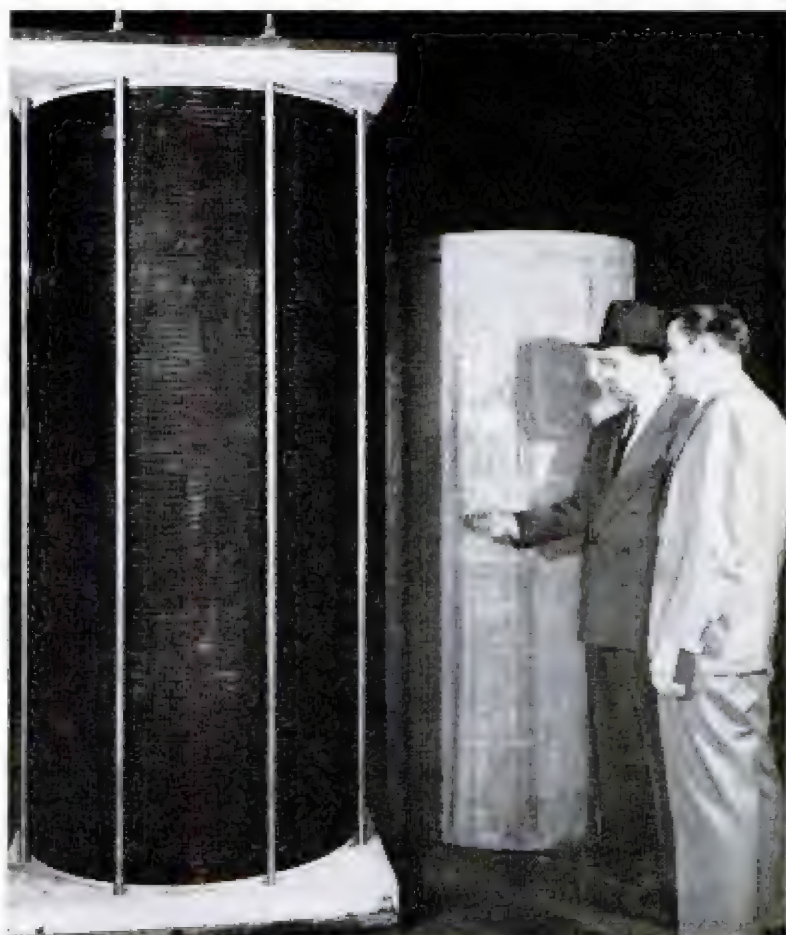
Tired of shoveling driveways, two Cleveland men invented miniature snowplows that let cars clear their own way. Two of the plows are mounted on either the front or rear bumper. The automobile then can be driven along wheel paths cleared for free passage. The plows also work in sand.

Induction Coil Slashes Time Required for Heating Aluminum

Ordinary household electric power is used to heat a 7700-pound aluminum ingot to working temperature in 50 minutes instead of the 12 hours needed by a conventional furnace. In a method developed by Alcoa, the unheated ingot (far right) is placed within a huge electrical coil (right). Sixty-cycle current flowing through the coil induces a heavy current in the ingot itself, causing the temperature rise in the metal.

Robot Controls Reactor

Atomic piles are prevented from blowing their tops by a robot safety system. Electronic instruments and motors of the system regulate the generation of power inside a reactor at any predetermined level. The system is said to be the first developed as a "package." The robot mechanisms keep moving rods of boron steel into and out of the pile to control the activity of the neutrons.

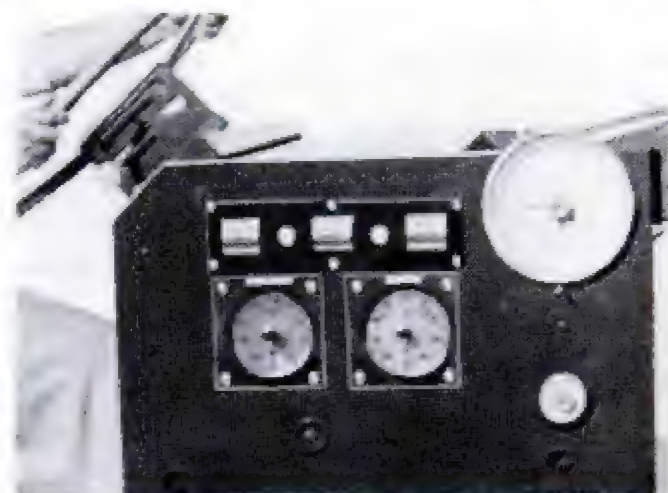


Students Drive Model Car Over Miniature Test Route



When the driver shifts gears, the car increases its speed realistically. Turning the steering wheel keeps the car on the moving highway. With the reverse gear, the driver learns to back into small parking spaces

Better drivers result from a training machine that tells you exactly what is wrong with your driving. The machine consists of regulation steering wheel, brake and clutch pedals, accelerator and instrument panel. The roadway, white lines painted on a green canvas, moves beneath the car at speeds regulated by the accelerator. The model responds as a standard car would. Various signals are included so the driver can test his reaction time and judgment of speed and distance. The machine shows each time a driver unnecessarily touches the clutch, brake or shifts gears.



Top, chassis of the car. Large gear steers the front wheels. Above, on one side of the machine are two counters that record the mistakes made by the driver



Plastic Shell Equips Phone For Two-Way Listening

Two persons can share the same telephone with a device patented by Roger Heap of Lyme, Conn. Simple in design, it consists of a T-shape plastic shell which cups over the receiving end of the phone. The hollow arms transmit the message to listeners at both sides. Heap fashioned the device so that he and Mrs. Heap could join in three-way conversations with their son in Detroit.



British Information Services photo

Transport "Swallows" Fighter Shorn Only of Its Wings

Through its broad front doors, a Bristol Freighter can "swallow" a jet fighter fuselage and carry it away for overhaul or repair. Only the wings, easily detached, have

to be removed. The rest of the fighter fits in easily. The Royal Canadian Air Force previously had to ship damaged planes by truck and rail to repair depots.

200-Pound Falling Weight Drives Posts Into Ground

Steel or wood posts up to four inches in diameter are pounded into the ground by an implement that is mounted on a tractor or pulled by a truck. Operated by power take-off or gasoline engine, the post driver has a free-falling 200-pound weight that delivers 25 blows a minute. It operates at 53 to 100 inches above the ground. Requiring only one operator, the device drives posts about twice as fast as other methods, and can even drive steel posts into frozen ground. The driving head can be tilted when driving posts into hill-sides or into uneven ground. If desired, the head may be inverted and used to break pavement or tamp soft ground.

¶Prof. Alex D. Krieger of the University of Texas estimates that man has inhabited America for well over 15,000 years.





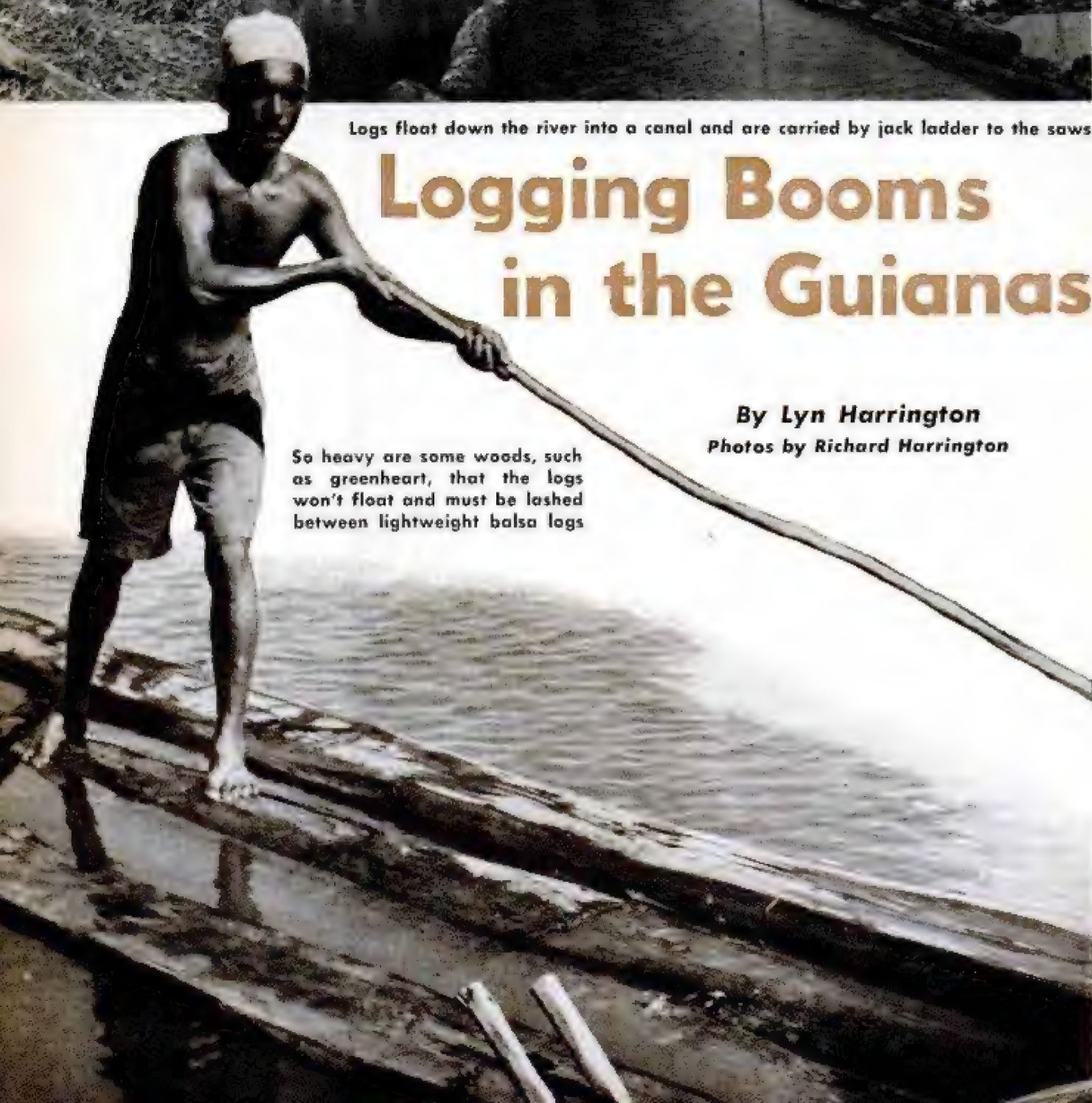
Logs float down the river into a canal and are carried by jack ladder to the saws

Logging Booms in the Guianas

By Lyn Harrington

Photos by Richard Harrington

So heavy are some woods, such as greenheart, that the logs won't float and must be lashed between lightweight balsa logs





Along the canal stretches a narrow-gauge railway on which logs are hauled to the mill by water buffalo

IN THE VAST, steaming jungles of Surinam and neighboring South American countries, large-scale logging is at last penetrating huge tracts of untouched timber.

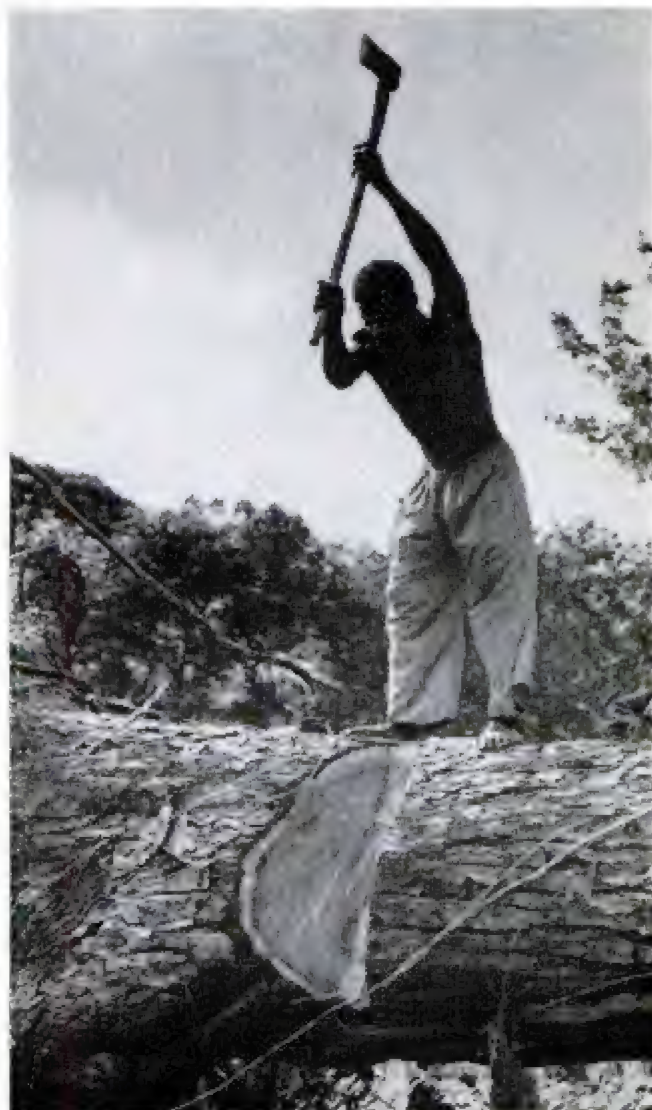
Near Paramaribo, capital city of Surinam (Dutch Guiana), stands the country's first plywood factory, built in 1947. Each morning, trucks crammed with barefoot loggers roll into the forest over shell-paved roads. At the cutting site the workers select their trees and chop a bite in each tree at a point about eight feet from the ground. Into the crevices go poles on which to stand while cutting proceeds with two-man saws. As soon as a giant topples, other men set about removing the limbs and cutting the trunk into standard lengths.

Logs may be lashed into rafts and floated down the Surinam River, dragged out by shiny tractors and transferred to modern trucks for shipment to the mill, or finish the last leg of their trip behind the water buffalo which takes the place of a locomotive on the tract's narrow-gauge railway.

At the mill, squared logs from the forest are cut into timbers for construction purposes and round logs that are smooth and fairly even go under the veneer knife. The veneer emerges as long, thin peelings, about six feet wide and up to $\frac{3}{4}$ inch thick. Treated for termites, the sheets are next glued, pressed together into laminate and trimmed to proper size.

Six hundred men are employed at the factory, a modern plant similar to mills in other parts of the world except that it has

Pajama-clad worker chops a tree trunk into standard lengths. Tractors snake logs out of cutting area





Sections of log await their turn under the peeling knife. Cores are used as fuel by the mill's steam plant
Rude platform is used to saw tree at proper height

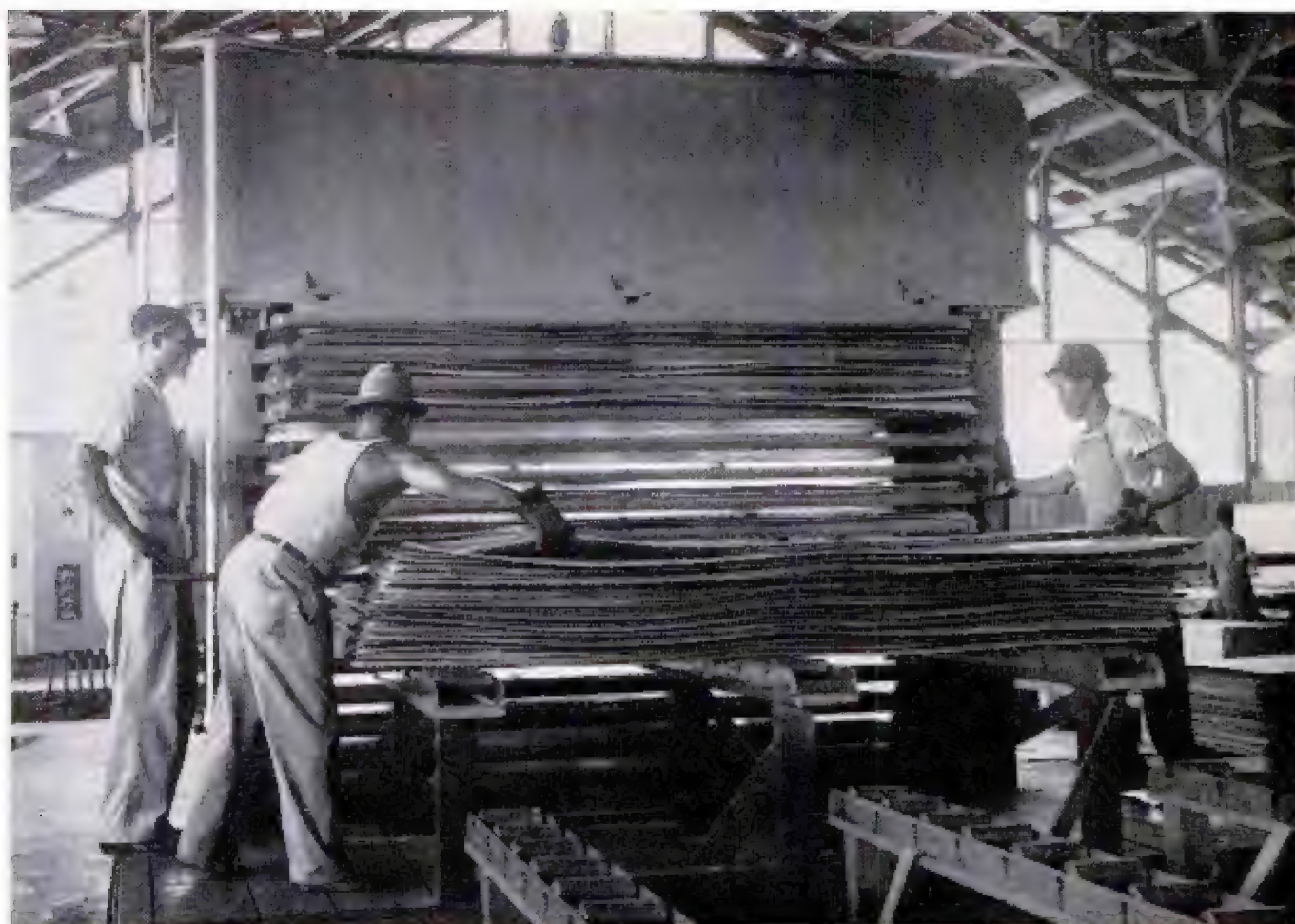


no walls; none are needed in this equatorial region. Power machinery (including power saws to fell the dense hardwood trees of the jungle), tractors and trucks combine to lower the cost of turning trees into lumber.

Only a few years ago the timber of the British and Dutch Guianas was considered almost worthless because of the high cost of removal. There was demand for a few types of valuable lumber, like mahogany, but the individual trees were scattered so sparsely about the jungle that removal cost was great. Besides, they were costly to cut and heavy to handle. Dutch Guiana exported almost no lumber; sole export of British Guiana was greenheart.

With the world lumber shortage came a demand for other kinds of South American lumber. Today, heavy woods like purpleheart, brownheart, ironheart and greenheart are being exported. "Kankantry" (a type of cottonwood), crabwood (a type of mahogany), "basra locus," "crappo," cedar, "pisie," "wana," banak and "copie" are being shipped abroad.

Greenheart has long been popular in dock construction and in shipyards. A very tough hardwood, it resists marine borers and has outlasted steel in underwater construction. Greenheart is so heavy it will not float. In order to raft one of the logs, it must be lashed between two lightweight



Adhesive and sheets of veneer are shoved into press where they will be stamped into plywood for use abroad

logs, such as balsa, to keep it from sinking.

Balsa came into general use along with the model-airplane fad, and even went into real airplanes. It is still a valued export of tropical South America.

Another forest product of the Guianas is balata—raw rubber from the milky sap of the bullet tree. The trees are tapped to produce a gallon per day per tree—about five pounds of balata. The sap is poured into a big wooden tray, where it gradually thickens into a tough layer that is peeled off and folded like oxhide for shipment. Balata is used in the manufacture of golf balls and machine belting, though synthetic rubber is cutting into its market.

But as the demand for rubber slows, the need for lumber increases as the other nations of the world consume their timber resources. Valuable timber covers much of the Guianas; Surinam, a country about the size of Wisconsin, is forested from the savannas which border the coastal plain south to the mountains of Brazil.

Holland buys a large part of the lumber output of its colony and the United States is another good customer, particularly for veneers. Spurred by the demands of the world's builders, the Guianas are importing northern machinery and expanding operations to answer the call for more lumber. Here in the rainy tropics may be the great timberlands of tomorrow. ★ ★ ★

Sheets of crude balata rubber are loaded into plane





Braided strings looped around the phonograph turntable operate the carnival rides within the five-gallon jug

Tiny Carnival Operates Inside a Five-Gallon Jug



Beggs has a delicate touch. He uses only two forceps, one long and one short, and a long wire to assemble his intricate models



KENNETH BEGGS of Minneapolis not only builds models inside of bottles—he makes them run with a phonograph motor!

Beggs recently completed an elaborate miniature carnival inside a five-gallon jug, a creation that took about 10,000 hours of nerve-racking work. Then he deftly hooked strings to the tiny merry-go-round, Ferris wheel and airplane swing and connected them to the turntable of an old phonograph. When the turntable revolves, the carnival under glass springs into life, with the Ferris wheel, carousel and airplane ride all working in perfect unison.

Most of Beggs' models are log cabins set against a backdrop of tiny trees. To provide a base, the modelmaker fills a gallon jug a third full of sand. Then a layer of hot paraffin is poured over the soil and left to cool. This provides a solid "floor" to work upon. Then the delicate task begins. Beggs gently inserts a template of cardboard into the bottle to serve as one side of his cabin. Next come the "logs," cut from wood matches, dipped in glue and tediously placed side by side on the cardboard. Beggs soon has all four walls inside the bottle and ready to be glued together. He values his miniature carnival at \$10,000.

Radio Television Electronics

MINIATURE WIRELESS MICROPHONE

BROADCASTING performers can rove at will when using a wireless microphone no larger than a pack of cigarettes. There are no cables to trip over; in fact, it is a miniature FM-transmitting system designed for high-fidelity sound pickup in stage, radio, television, motion-picture and industrial applications. The wireless microphone shown in photo A, together with its companion battery pack, are small enough to be held in one hand. The tiny battery pack is concealed easily in the operator's pocket as illustrated in the sketch.

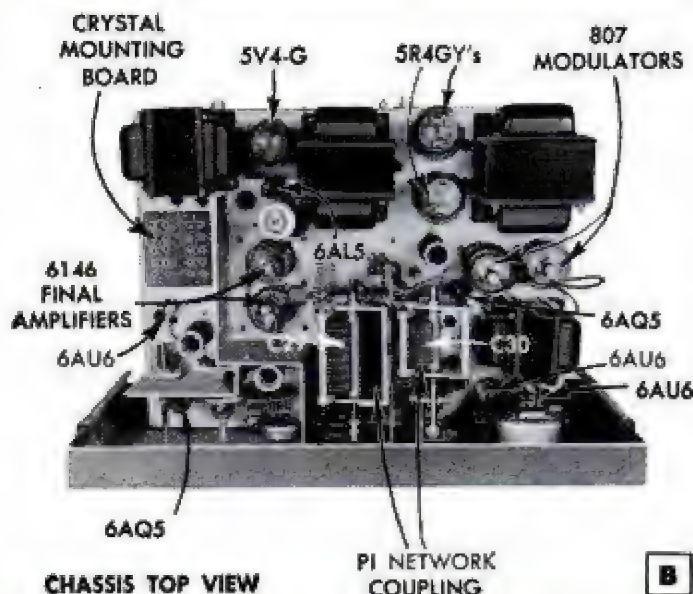
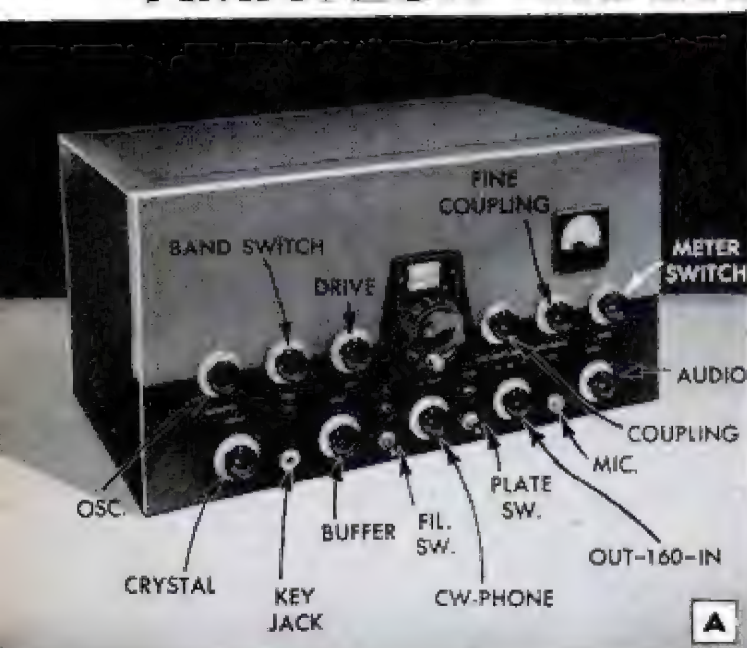
The receiving equipment (backstage) is shown in photo B. It consists of two small leatherette-covered portable cases, one of which houses a specially designed, highly sensitive receiver, the other, the power supply which also contains speaker-and-headphone monitoring facilities. The audio output of the receiver may be fed into standard mike inputs, as this miniature Tru-Sonic wireless-microphone system is interchangeable with sound equipment presently in use.

This system also makes possible amphitheater lecturing by surgeons in hospitals, recording the operation or the doctor's own comments for closed-circuit television. In industry, a technician may move about his work giving directions or descriptions with his hands free and no connecting cables to limit him. The tiny wireless-microphone FM transmitter employs two CK5672 sub-miniature tubes and it weighs only about four ounces.



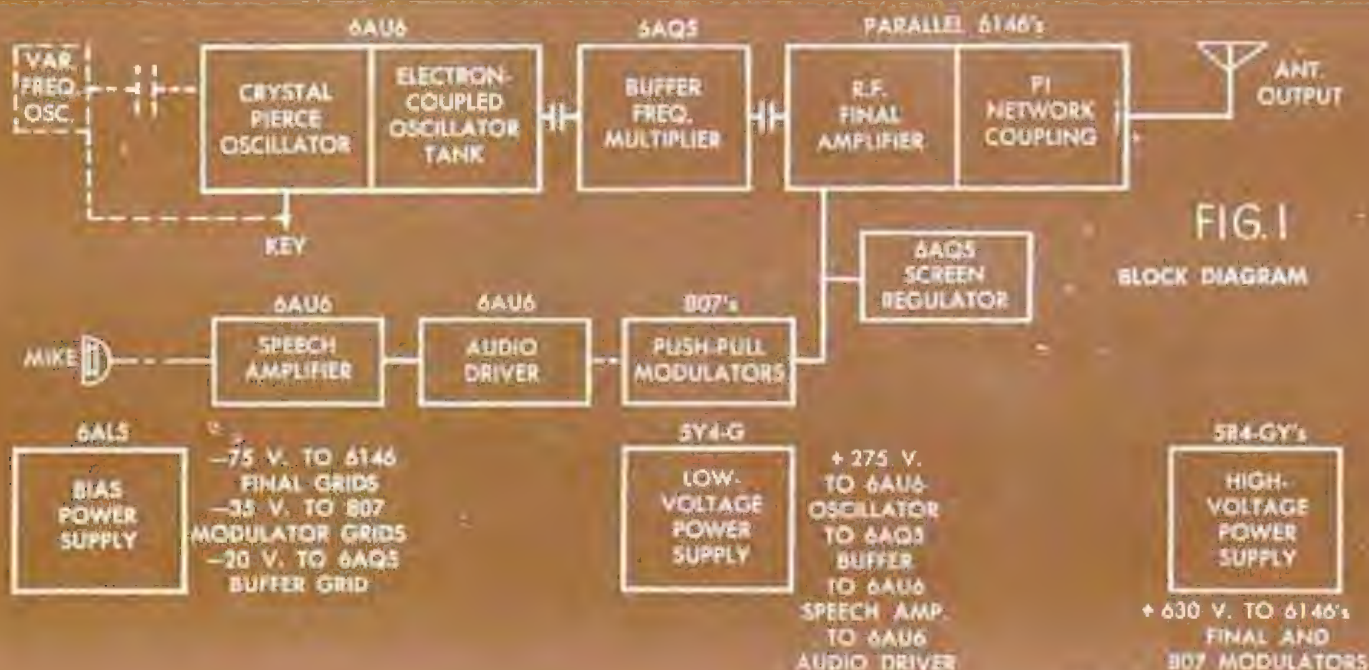
AMATEUR TRANSMITTER INCLUDES

By Frank L. Brittin W9DCX



TELEVISION INTERFERENCE (TVI) presented a greater problem to the radio amateur than broadcast interference (BCI) ever did. This was partly due to the fact that TV receivers operate at higher frequencies more susceptible to interference from amateur transmitters than are standard radios operating on the lower frequencies. Interference in television receivers also is caused by many other electrically operated devices, FM stations and even other television receivers operating in the immediate vicinity. Practically all of these interfering factors can be eliminated by proper shielding and filtering. Television set manufacturers soon recognized this fact and incorporated necessary shielding in their receivers. Manufacturers of many electrical appliances keep this type of interference in mind when designing their new products.

During the past three years much technical information has been made available to radio amateurs to aid them in TVI proofing their transmitters. Such articles have appeared frequently in *QST*, *CQ* and other magazines devoted exclusively to ham radio activities. That these instructions have been followed is evidenced by the comparatively few complaints now made by TV set owners, and the fact that there are over 104,000 licensed amateur radio operators in the United States. Recommended measures include complete shielding and filtering, or bypassing, of all power supply or



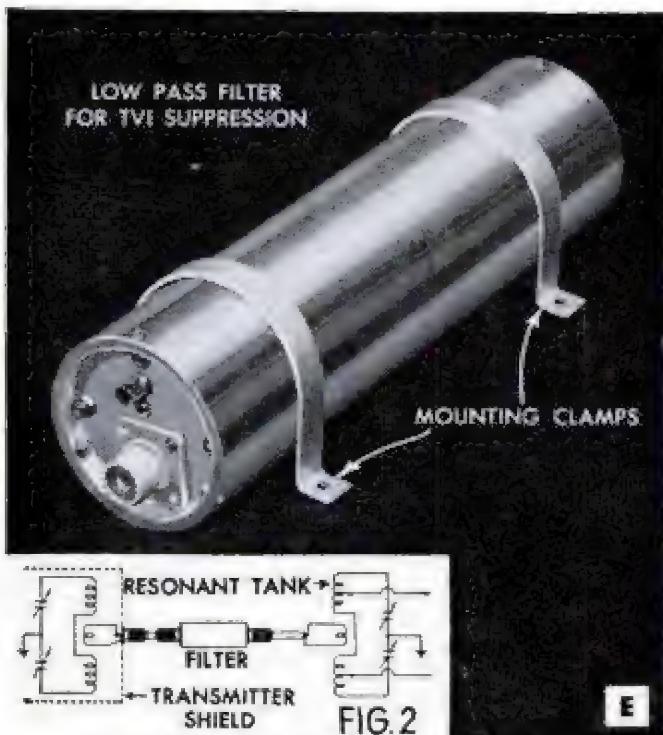
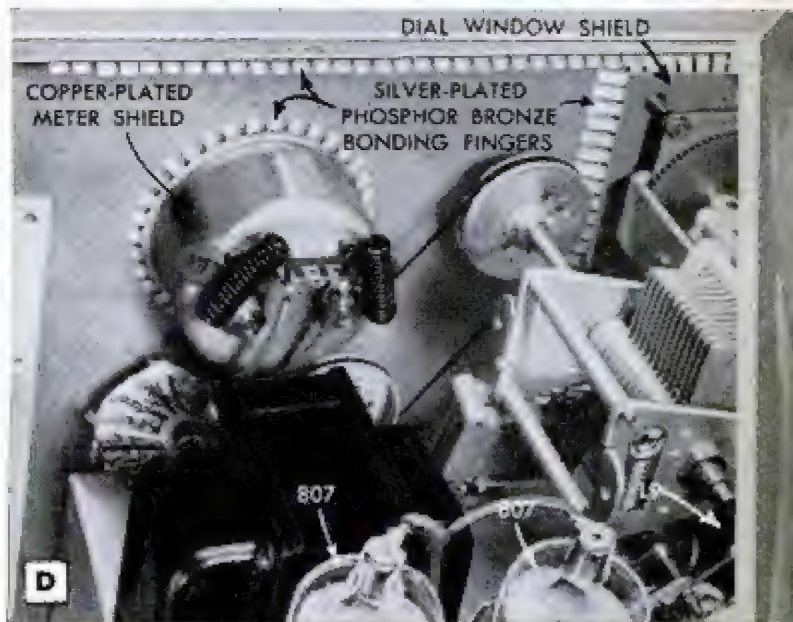
IMPORTANT TVI-SUPPRESSION FEATURES

control leads to and from the transmitter.

Both manufacturers, and the hams themselves, many of whom are well-known radio engineers such as A. M. Pichitino WØEDX, photo C, whose original low-pass filter for TVI suppression appeared in the January 1950 issue of *QST*, have cooperated in designing many of the necessary filters and other devices. Pichitino also won top phone honors in a recent American Radio Relay League contest. Several manufacturers make complete TVI-suppressed amateur transmitters, but some of these are out of the pocketbook range of the average amateur. However, a complete kit for building a TVI-suppressed transmitter at moderate cost is now available from radio-parts houses. This is the E. F. Johnson Viking II kit which includes all the necessary parts, hardware, tubes, wiring harness, special cabinet and complete assembly instructions.

Photo A shows the completed transmitter, and a top view of the chassis base appears in photo B. The main TVI-suppression features are illustrated in photos D, E and F. These include the heavily copper-plated steel cabinet with perforated top and bottom to provide ventilation. The lid is easily removed as shown in photo F; it is bonded with silver-plated, phosphor bronze contact fingers, and this same bonding strip is used in the locations indicated in photo D. Special shields for meter, dial window and VFO (variable-frequency oscillator) power receptacle, maintain effective TV shielding. Filters consisting of

(Continued to page 240)



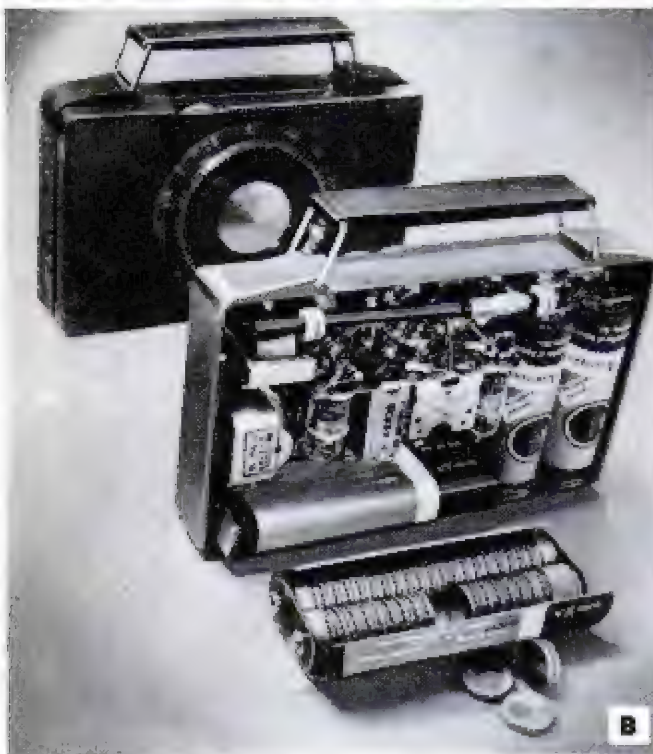
Radio and Electronics Today

HOMEMAKERS and decorators faced with the problem of having varied activities going on in the same room with radio, television and record-playing equipment will welcome this idea of a room-divider unit illustrated in photo A. This experimental model recently suggested by Motorola engineers as a "designer piece" of the future, is 5½ ft. in length and 5 ft. high.

Perhaps one of the most interesting developments in personal-type portable radio receivers is the long-life alkaline "B" battery, recently introduced by the tube department of RCA Victor. These "crown type" cells, shown in photo B, resemble bottle caps which are placed close together to form the necessary 67½-volt B battery in the set illustrated. The "A" battery is a new design claimed to have long life.

The grid-dip meter shown in photo C was assembled from a Heathkit. This type of test meter has many useful applications for radio amateurs, servicemen and experimenters. Grid-dip meter operation is based on a sensitive meter measurement of grid current in a variable oscillator circuit. When coupled to a resonant circuit, a pronounced dip of the meter pointer occurs as the oscillator is tuned through that frequency under test—hence the name grid dip. It is useful in tuning and neutralizing transmitters, also in TV and radio repairs.

Now you can listen to radio programs while you are plowing the fields for spring planting. The rugged, automatic type TR-12, shockproof mounted and weather-proofed radio shown on the tractor in photo D, is an 8-tube receiver that operates on a 6-volt storage battery. It is claimed to have sufficient volume to bring in your favorite music, weather forecasts, news and crop reports loud enough to overcome motor noise.



the

POPULAR
MECHANICS

CRAFTSMAN



18th Century
Step Table

PERIOD TABLES

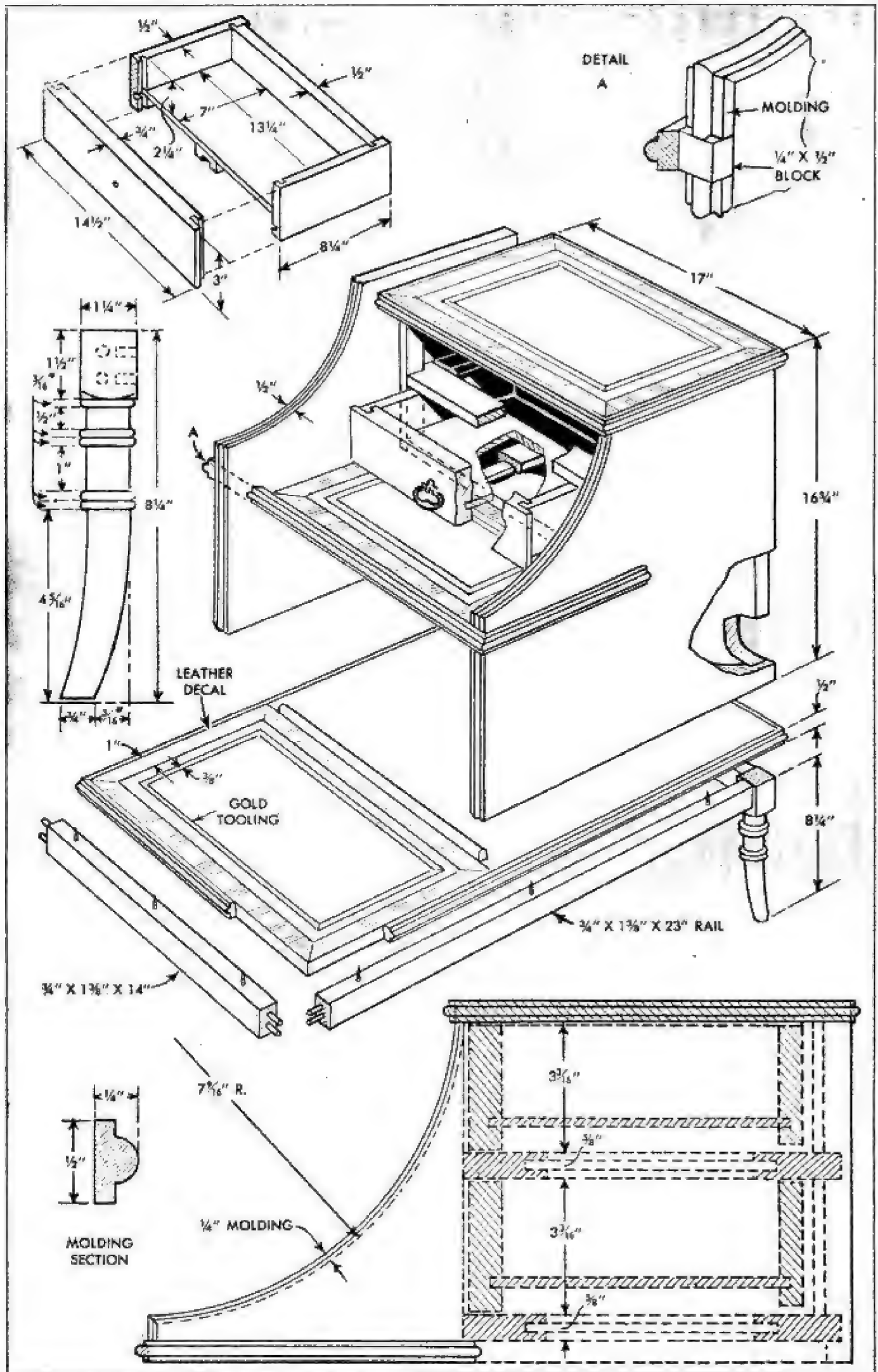
feature "plastic inlay" tops

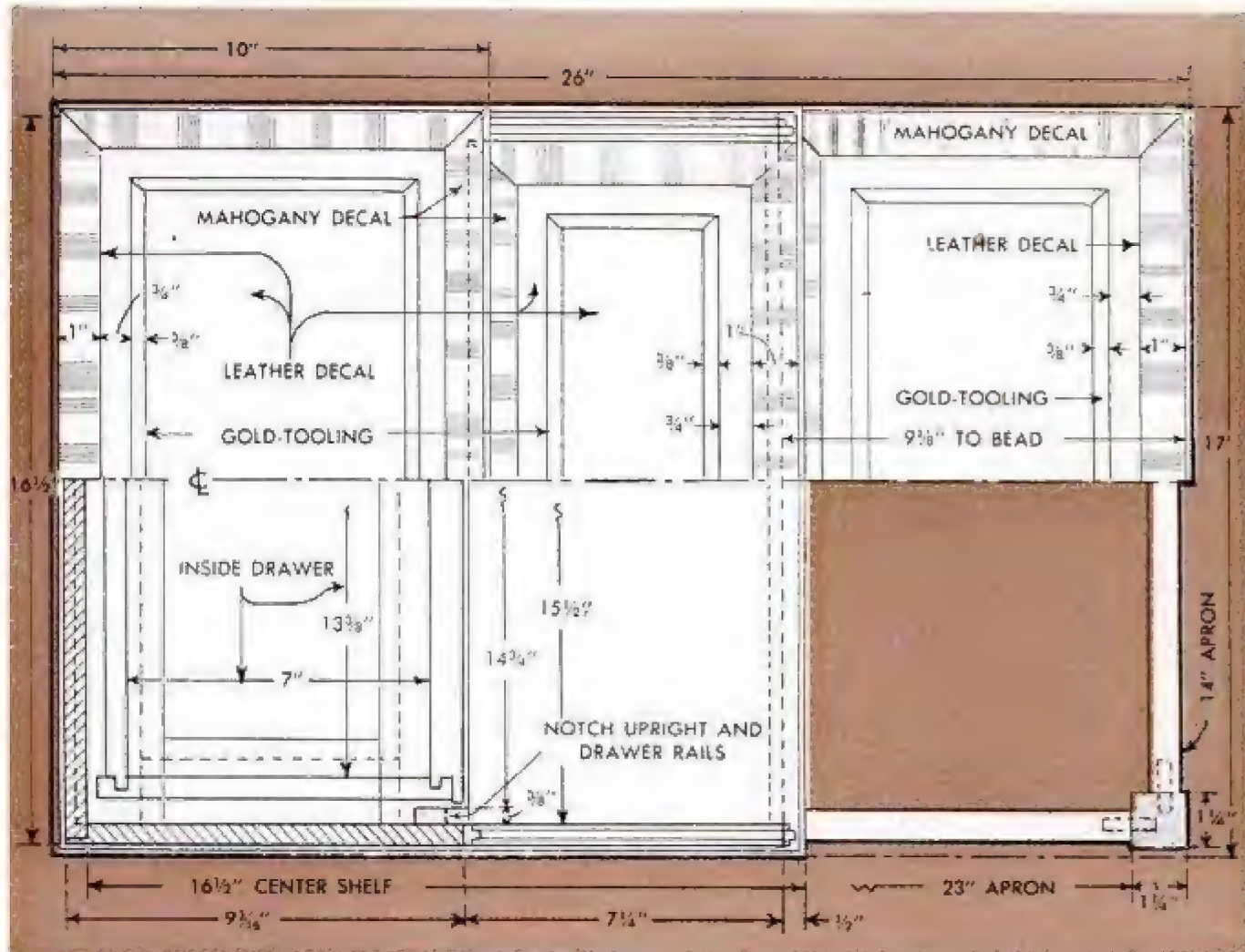
By John Bergen

THE FURNITURE-STORE price tag on tables like these would probably make your eyes pop—but you can reproduce them for a surprisingly few dollars. Outside of legs, posts and molding where solid mahogany is used, gum, poplar or birch-faced plywood is transformed into beautiful "mahogany" by the use of easy-to-apply plastic veneer—described in the Feb. 1952 issue of *Popular Mechanics*. Even the rich-looking leather and gold-inlay work on the table shelves is of this inexpensive decal-type finish. And it takes close scrutiny to tell it from the real thing. So, make sure the saw blade's sharp, dust the cobwebs from your lathe and turn out some of the most distinctive furniture ever to come from your shop.



18th Century Tier Table





Note from plan view of step table that center section of each shelf is covered with leather decal surrounded with a 1-in.-wide band of mahogany wood-grain decal. Gold-tooling decal is applied over "leather"

18th Century Step Table: The base frame and legs of this table are of solid mahogany, the frame rails being $\frac{3}{4} \times 1\frac{3}{8}$ -in. stock doweled to the four legs. The upper portion of each leg is $1\frac{1}{4}$ -in. square and the section directly below is a straight beaded turning. The lower $4\frac{3}{16}$ in. of the leg is splayed. Each leg is made from a block $1\frac{5}{8}$ -in. sq. and $8\frac{1}{4}$ in. long. The center portion is turned and the splayed portion is worked to shape by hand. The diameter of the beads on the turned section of the leg is $1\frac{3}{16}$ in., while the basic diameter of the turning is $\frac{15}{16}$ in. The splayed portion tapers from a $\frac{15}{16}$ -in. dia. at the top to a $\frac{3}{4}$ -in. dia. at the bottom.

The frame rails are fastened to the $\frac{1}{2}$ -in.-plywood bottom shelf with glue and countersunk flat-headed screws. A $\frac{1}{4} \times \frac{1}{4}$ -in. groove for a stop bead is cut across the top surface of the bottom shelf, $9\frac{1}{8}$ in. from the front edge of the panel, as indicated by the dotted lines in the detail above. This can be done with a router or by running a dado all the way across the panel. The beaded edge molding and the vertical side panels will conceal the ends of the groove. The stop bead which is glued in this groove is a strip of $\frac{1}{4} \times \frac{1}{2}$ -in. mahogany. The exposed edge of the stop bead is rounded, thus providing a neat-looking separator be-

tween the front and rear section of the bottom shelf.

The side panels are grooved $\frac{1}{4}$ in. deep to take the edges of the center shelf and rabbeted for the back panel. The top shelf is rabbeted $\frac{1}{4} \times \frac{1}{2}$ in. for the upper edges of the side panels and back panel.

Drawer frames are built of $\frac{5}{8}$ -in. stock, mahogany being used for the exposed portions, if desired. Front and back members are grooved to take tenons cut on the ends of the side members. The back panel is grooved $\frac{1}{4}$ in. deep for the rear edges of the two drawer frames. The latter are simply butted and glued to the side panels and the front frame members are notched to form half-lapped joints with an upright at each side of the drawer-frame assembly. The drawers themselves are made as in the upper left-hand detail on the opposite page, $\frac{1}{4}$ -in. plywood or hardboard being used for the drawer bottoms.

Exposed edges of the shelves and side panels are covered with $\frac{1}{4} \times \frac{1}{2}$ -in. beaded molding which also should be of mahogany. All corner joints of the molding are mitered and the ends of the molding that extend around the side panels from the front of the center shelf are coped to form an end bead. The points where the center-shelf

molding and the side-panel molding cross must be fitted with $\frac{1}{4}$ x $\frac{1}{2}$ -in. blocks as in detail A on page 166.

The detail on page 167 gives the layout for applying the leather, gold-tooling and striped-mahogany plastic veneer to the table shelves. The gold-tooling decal is applied directly over the leather. Mahogany-crotch plastic veneer is applied to the side panels and drawer fronts, while the rear section of the lower shelf can be covered with plastic veneer or simply painted with a toner to blend with the mahogany finish. Solid-mahogany parts of the table are finished natural.

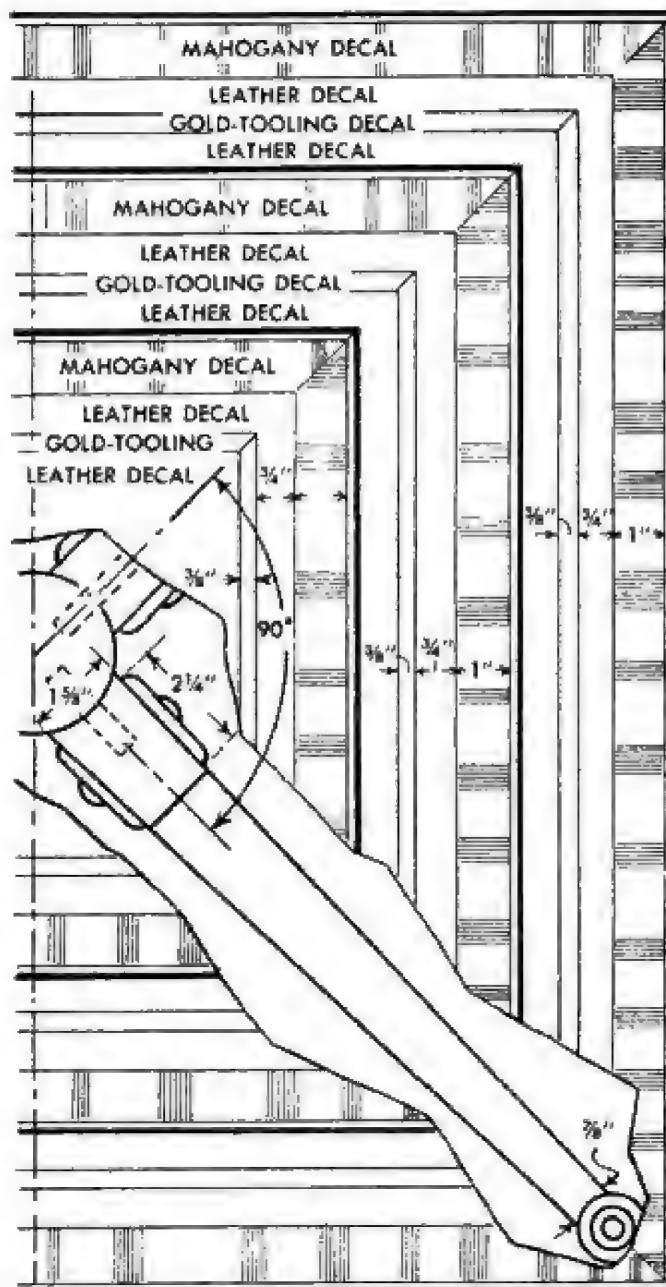
18th Century Tier Table: The mahogany turning for the center post is made in three parts, following the over-all dimensions given in the half pattern on the opposite page. A $\frac{3}{4}$ -in. cleat, 8 in. sq. and beveled all around, is screwed and glued to the top end of the lower turning to provide support for the lower shelf. The center of the cleat is bored to take the end of a $2\frac{3}{4}$ -in. length of 1-in. dowel. Both the lower shelf and the lower end of the center-post section are bored to take the remaining length of the dowel, and the shelf is screwed and glued to the bottom of the center section. Then the post-and-shelf assembly is glued over the dowel and to the 8-in.-sq. cleat. The center and top shelves and the upper-post section are joined similarly.

The shelves, which are covered with plastic veneer, can be of gum, poplar or birch plywood. The four edges of each shelf are covered with $\frac{3}{8}$ x $\frac{5}{8}$ -in. mahogany molding, mitered at the corners.

Curved legs, tapering from a $1\frac{5}{8}$ in. width at the top to $\frac{7}{8}$ in. at the bottom, are bandsawed from hardwood. As the legs also are covered with plastic veneer, any close-grained hardwood can be used. The inside flat on the upper portion of the leg is drilled for two $\frac{1}{4}$ -in. dowels and then filed or drum-sanded concave to match the radius of the center post. The lower end of each leg is similarly drilled and shaped to match the radius of the 1-in.-dia. foot.

Each foot is $2\frac{1}{4}$ in. long and the upper $1\frac{1}{4}$ -in. length is turned to a 1 in. dia. Then a $\frac{3}{16}$ -in. bead is turned to an over-all diameter of $1\frac{1}{4}$ in. and the lower portion of the foot is tapered from 1 in. dia. to $\frac{5}{8}$ in. dia. This is shown in the squared pattern on the opposite page. A $1\frac{1}{4}$ -in.-dia. rosette is glued to the top of the foot. This rosette, as well as the large, $2\frac{1}{4}$ -in. rosettes used to decorate the upper sides of the legs, may be purchased, or turned from mahogany as in the detail above the table drawing.

Plastic veneer, preferably in fiddle-back mahogany, should be applied to the surfaces of the legs before mounting the large rosettes. This will save the task of trimming

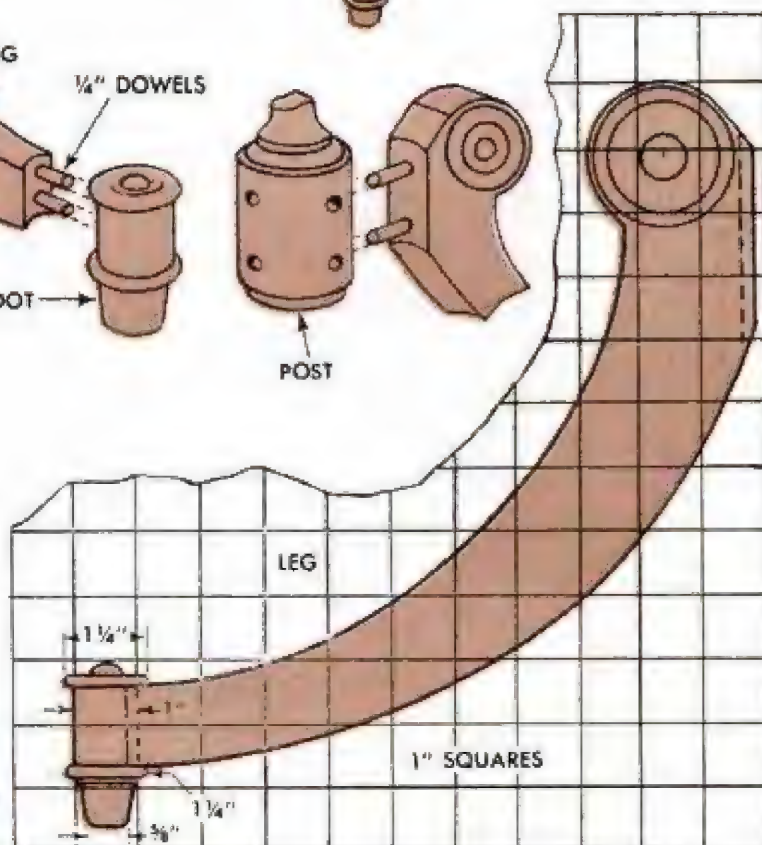
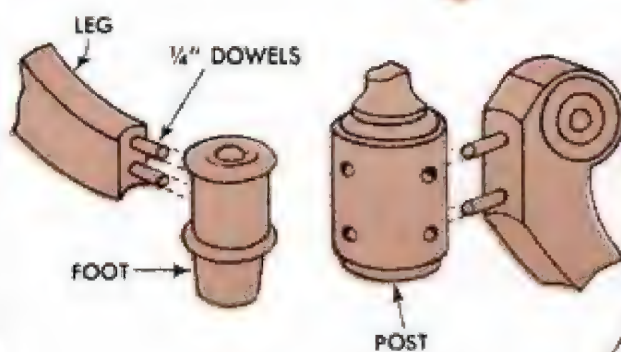
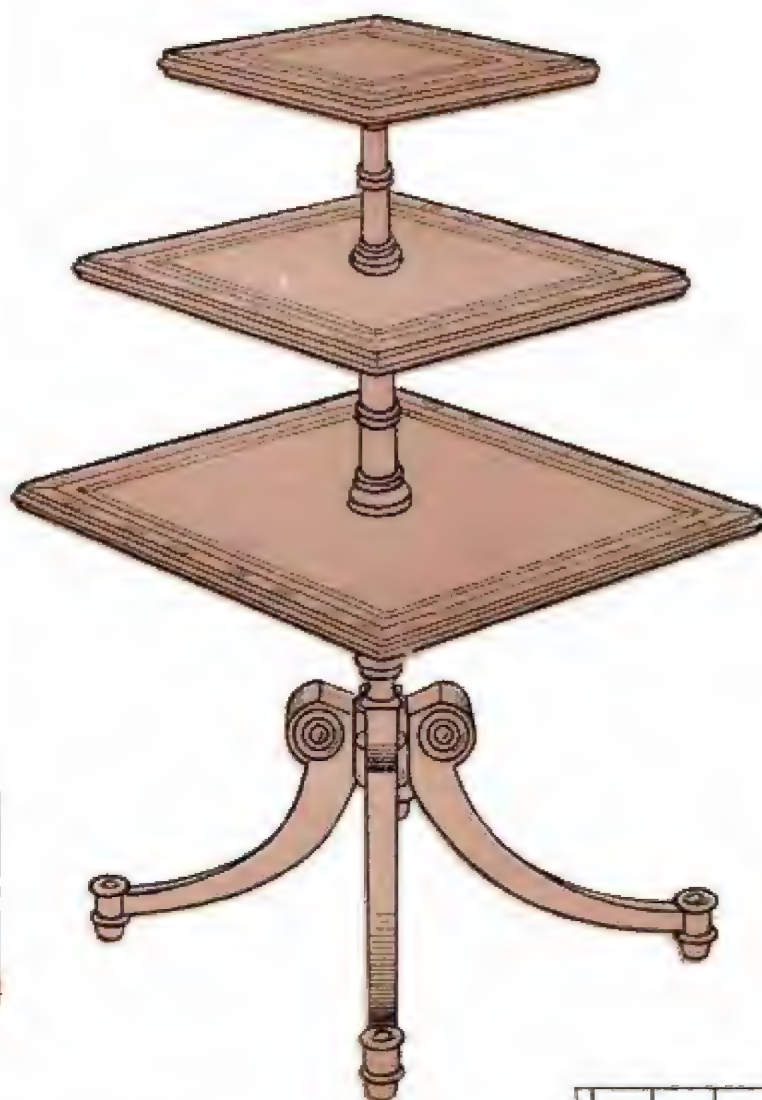
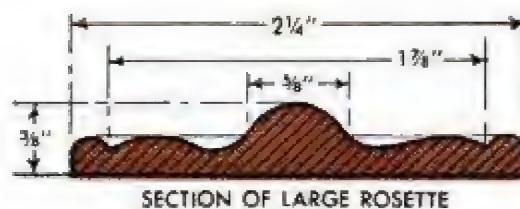
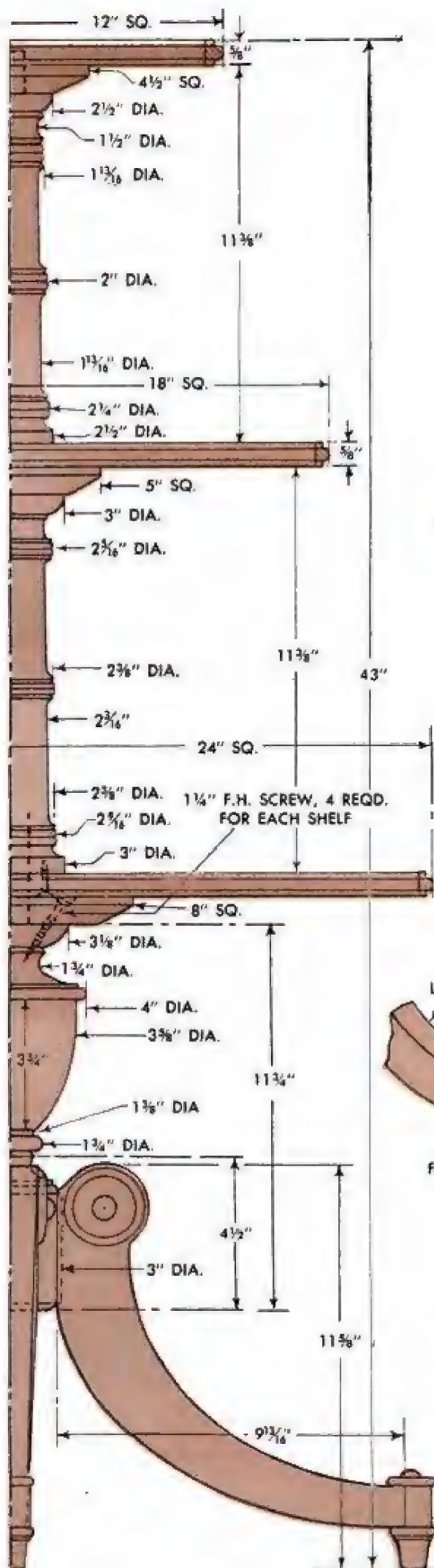


Plastic-veneer treatment of shelves on three-tier table matches step table. Stop the veneer at edge molding

the veneer around the rosettes and result in a neater job in the long run. When applying the veneer, cut away most of the veneer which would be under the rosettes.

Plastic veneer is applied to the three shelves as in the detail above. Carefully miter the corners by overlapping adjacent strips of veneer, cutting the mitered joint and then pulling out the excess scrap before finally smoothing the veneer in place with a squeegee. Trim the veneer neatly along the joint of the shelf and molding.

Apply the plastic veneer to the shelves and finish the mahogany center post before assembly. Spray the veneered portions of the shelves with clear, satin-finish lacquer or varnish. Any joints or edges of the plastic veneer which do not fit as neatly as you would like, can be concealed by rubbing the spots with a dry stain, commonly sold in solid form for removing scratches. This is done before finishing. ★ ★ ★



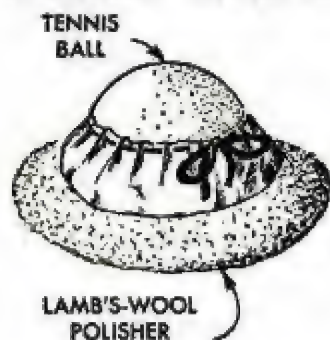
Scraper Cleans Snow From Car



Using an ordinary window squeegee, you can make a handy scraper for cleaning snow from your parked car without getting the snow on your clothes. Fit the squeegee to a 2 or 3-ft. length of broomstick and bend the blade of the squeegee at right angles to the broom handle. The scraper can easily be stored in the trunk.

Walter L. White, Chicago.

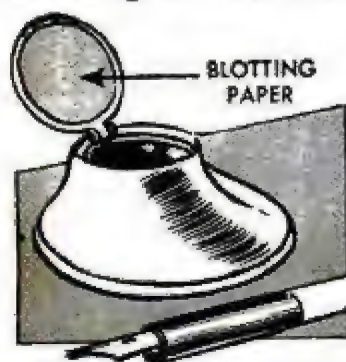
Tennis Ball in Polishing Bonnet Provides Hand Rest



A standard 4-in. lamb's-wool polishing bonnet, such as is used with a portable electric drill, can be converted for use as a hand polisher and buffer if a tennis ball is inserted in it as a

hand rest. Simply insert the tennis ball in place, draw the strings of the bonnet tight and tie. This makes a polishing head that is comfortable to the hand for use in polishing furniture or a car.—Glen F. Stillwell, Manhattan Beach, Calif.

Sealing Loose Inkwell Cover



If a loose-fitting cover on an inkwell of the type shown in the illustration allows the ink to evaporate rapidly, blotting paper can be used to provide a seal. Cut a piece to press-fit under the

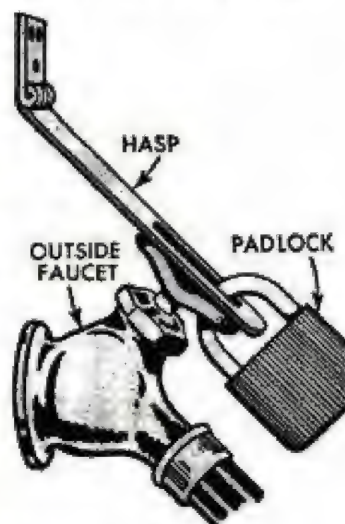
rim of the cover. A seal of this type will slow down evaporation considerably and can be replaced easily when ink-soaked.

R. M. Woodbury, Natick, Mass.

Lock for Outdoor Water Faucet

To prevent children from opening an outdoor water faucet, one homeowner devised the method shown in the illustration for locking the faucet. He attached a hasp to the wall above the faucet with bolts and expansion sleeves, and placed it so as to allow the hasp slot to line up with one of the openings in the handle of the faucet. Then he passed a padlock of the appropriate size through both the hasp and the faucet handle. If the faucet handle happens to be of the metal disk type, the same idea can be used by drilling a $\frac{1}{4}$ or $\frac{3}{8}$ -in. hole in the handle to take the shackle of the padlock.

Arthur Trauffer, Council Bluffs, Iowa.



Reducing Putty Drying Time

The one hour of drying time usually needed when powdered putty is used to make repairs, can be cut substantially if some of the dry powder is sprinkled over the spot which has been repaired. The dry powder, acting as a blotter, draws some of the water from the putty in the repair, and then is brushed off. To get better contact, press the powder into the repaired spot with a putty knife. When the spot takes on a lighter color, the putty is becoming dry.

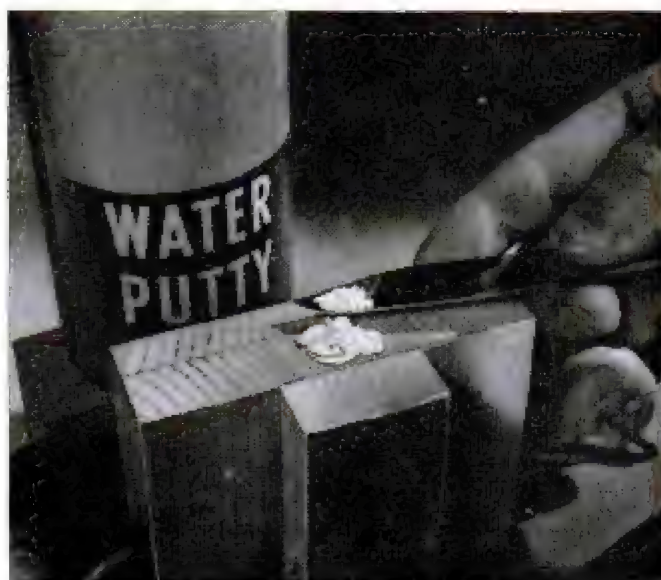


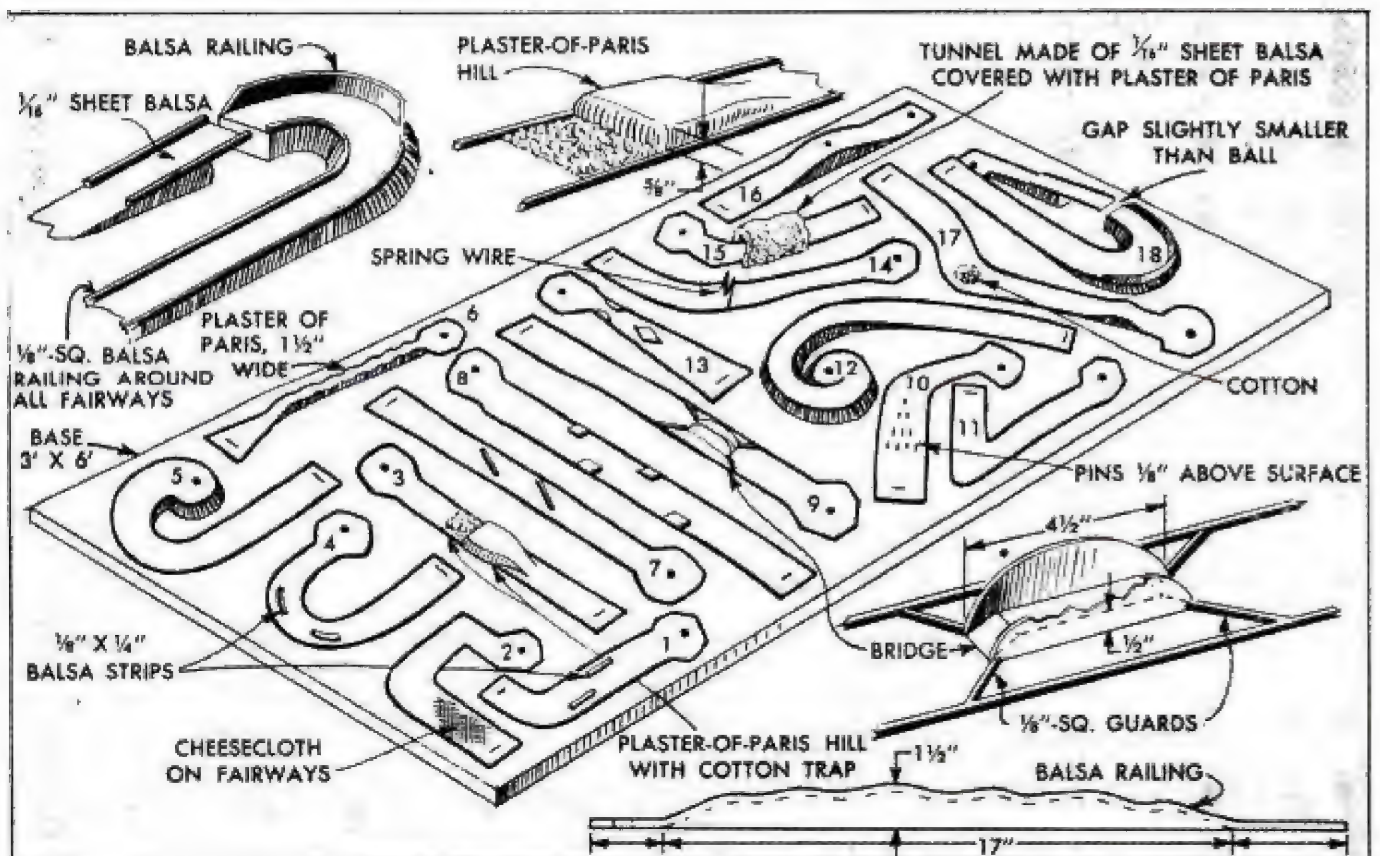


TABLE-TOP GOLF COURSE

MANY EVENINGS of fun for the entire family is the outstanding feature of this table-top golf course. Easily built of plaster of paris, balsa and cheesecloth on a 3 x 6-ft. base, the course is played with $\frac{1}{4}$ -in. ball bearings and small wooden clubs. The base may be a panel of plywood, hardboard, fi-

berboard or cardboard. Thin balsa strips provide railings and obstacles, and hills are built up of plaster of paris. Cheesecloth is used to cover fairways and greens, as it forms a slightly rough surface to permit better control of the ball bearings.

Lyle M. Christ, Alliance, Ohio.





Brackets Hold Crutches Within Easy Reach

One amputee veteran of World War II has found a very satisfactory and inexpensive way of keeping his crutches within easy reach of his bed and at the same time out of the way. He attached a pair of plastic drapery tiebacks to the wall near the head of his bed, as shown, and another pair to the wall near his desk. They are placed at a height to permit the crutches to clear the floor. Available in several colors, the tiebacks can be selected to harmonize with the wall.—Ross D. Meyer, Detroit, Mich.

Deckle-Edged Greeting Cards



When making your own Christmas cards, you can produce a deckle-edged effect on the edges by using a bread knife of the type shown. Tear the edge against the blade to get the desired effect. The torn edges may

then be tinted with water colors for a pleasing holiday effect. Photographers can use this kink to decorate the edges of prints.

Repairing Open Joints in Doors

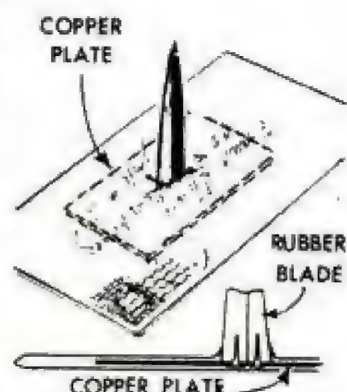
For a simple but permanent repair when an old door has opened at the joints, place a bar clamp across the door and draw up the joints tight. Then while the door is still clamped, drive two or three screws

through the stiles and into the housed tenons, locating the screws about $\frac{1}{2}$ in. from the joint. The heads of the screws should be countersunk and filled with wood putty.

J. Howard Cooper, Philadelphia, Pa.

Novel Paperweight Resembles Spear

This unusual paperweight gives the illusion that the papers are pierced by the blade of the weight. Actually only a dummy envelope has been penetrated. The blade may be cut from a toy dagger or shaped from a piece of



brass. The weight is provided by a sheet of copper small enough to fit inside of an envelope. Two nails are pushed through holes drilled for them in the copper, and then the copper is inserted in an envelope. The blade is forced through the envelope and then down on the two nails.

Frank Shore, New York City.

Memo Pad for Use With Telephone Improvised From Film Pack

Needing a memo pad for use with telephone calls, I found that a discarded film pack containing sheets of paper cut to the proper size filled the bill very satisfactorily. The overlapping top side of the pack holds the sheets firmly in place, while the weight of the pack makes it possible to write without having to steady the pad. A moistened finger or a pencil eraser may be used to free one end of the top sheet for quick removal.—David Findlay, Brooklyn, N. Y.



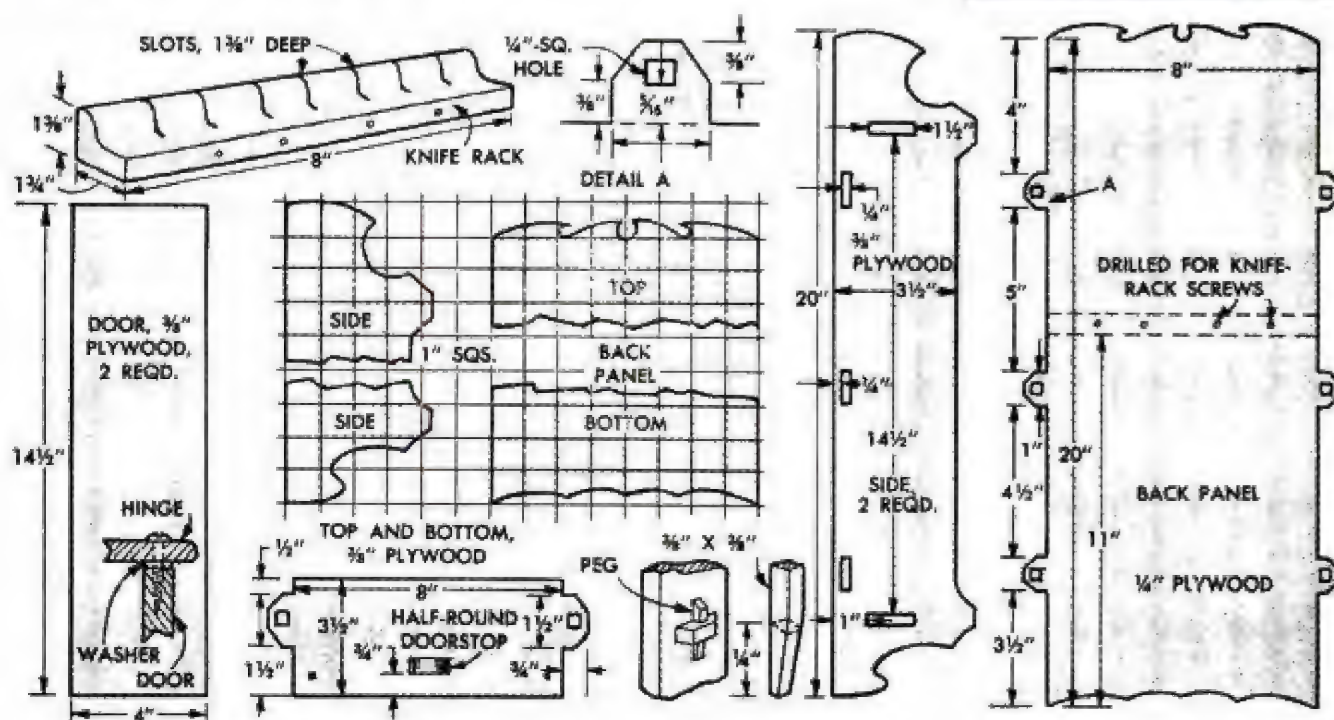
CUTLERY CABINET

By Dick Hutchinson

Here's a chance to put your craftsmanship on display by building this interesting cutlery cabinet. The cabinet features novel interlocking construction and, whether made of plywood, hardwood or knotty pine, it makes an attractive addition to a kitchen or dining room.



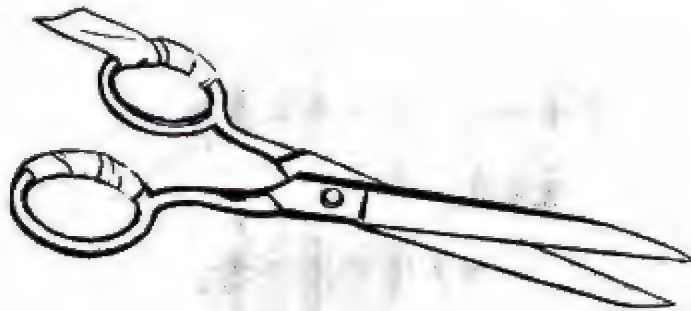
TO BUILD THIS cutlery cabinet, use $\frac{1}{4}$ -in. plywood for the back panel and $\frac{3}{8}$ -in. plywood for the remaining parts. Birch plywood was used for the cabinet pictured. First, jig-saw the back panel, following the squared pattern for the top and bottom scrolled designs. Then cut the two side panels, slotting them to receive the tabs on the back panel and top and bottom pieces. The latter are cut identically and a section of half-round molding is glued to the inside surface of the bottom piece to provide a stop for the cabinet doors. The doors, which are 4 by $14\frac{1}{2}$ -in. panels, are hinged as in the lower left-hand detail, round-headed wood screws being driven through oversize holes in the top and bottom pieces to form pivots. The knife rack is cut and shaped from $1\frac{3}{8}$ -in. hardwood and slotted to take the knife blades. The narrow edge of the rack is glued and screwed to the back panel. Finish all parts separately before assembly, and then lock the parts together by driving tapered hardwood pegs through the projecting tabs.



Solving

PROBLEMS

(SHARP STUFF)



CUTTING BREAD into uniform slices is done easily by using two knives bound together with rubber band wrapped around handles. Inner blade does cutting while outer blade serves as guide

TO PREVENT SORE FINGERS when using scissors for prolonged periods of time, pad handles with moleskin adhesive tape, left. Apply the soft tape to the handles where fingers rub against metal

TWO ADHESIVE BANDAGES applied to medicine-cabinet door, below, form holder for fingernail scissors





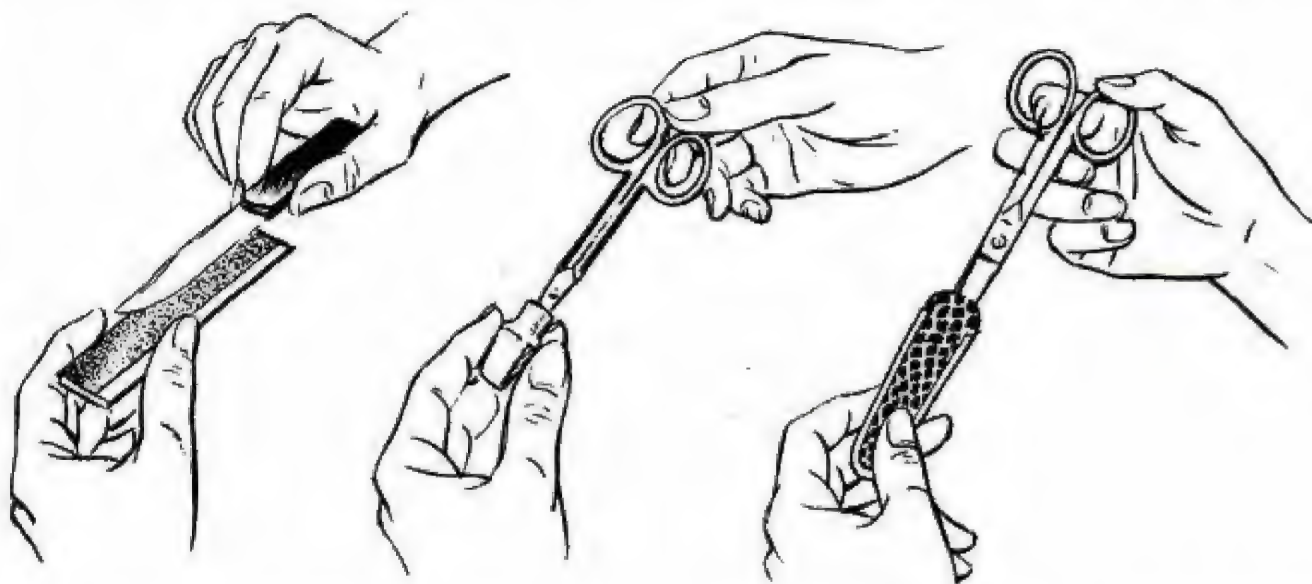
KNIVES may be honed on dowel wrapped with piece of 2/0 emery cloth



SLOTTED hardwood drawer fitted in knife drawer keeps knives separated to preserve sharpness of the blades



PAINTING THE TOP OF KNIFE HANDLE tells you at glance which edge of blade is the cutting edge. This is especially helpful from a safety standpoint when edges of the blade are curved similarly

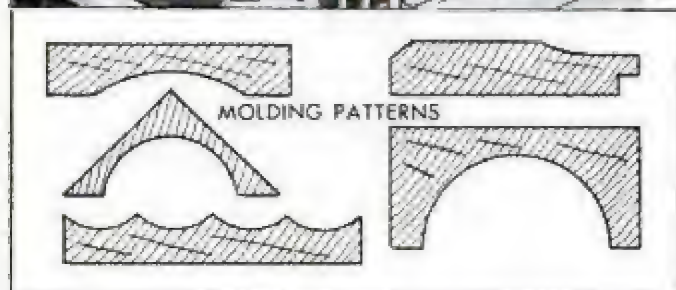


HANDY "WHETSTONE" for small kitchen knives is made by wrapping a piece of wood or heavy cardboard with emery cloth. Tack or glue cloth to backing

SHEATH for fingernail scissors can be improvised from an ordinary slip-on pencil eraser. Sheath protects your fingers as well as blades of the scissors

SHARP-POINTED scissors may be carried in pocket or handbag without danger if points are shielded by slipping a finger-nail-file case over blade ends

Table Saw Used as Wood Shaper



Picture framing, ceiling cove and other decorative wood-strip moldings can be shaped on a table saw. Clamp a straight piece of wood diagonally across the saw table with two C-clamps, as shown, to serve as a fence. The greater the angle between the saw blade and fence, the wider will be the groove cut in the stock as it passes over the saw. Raising the saw blade will increase both the width and depth of the cut. When making deep cuts, start with the blade only about $\frac{1}{16}$ in. above the table. Make several passes, raising the saw no more than $\frac{1}{16}$ to $\frac{1}{8}$ in. after each pass until the desired depth has been reached. It is best to practice on scrap pieces of lumber to get the correct pattern, before running a good piece of stock through the saw.

Melvin Ham, Choteau, Mont.

Extra Mittens for Children Dried Over Warm-Air Vent

To keep her children supplied with warm, dry mittens during the winter months, one homemaker hangs extra pairs on a clothesline near a warm-air vent. The mittens are secured to the line by means of spring-type clothespins suspended 4 or 5 in. apart along the line. The line, which is threaded through the spring coil of each clothespin and knotted to separate them,

is kept within reach of the smallest child to encourage the children to hang up their wet mittens and change to dry ones.

Rosena Wark, Kensall Park, Ont., Can.

Magnifying Small Parts

If you lack a magnifying glass for examining or adjusting small parts, a magnifying mirror of the type sometimes used as a shaving mirror not only will provide an effective substitute but will also leave both hands free to work. To use, simply adjust the mirror as shown, moving the article away from it to increase magnification, or closer to decrease it.



Cold Aids in Replacing Crystal

When a watch crystal which has dropped out of its frame is difficult to replace, put it into the refrigerator for a short time. The cold will contract it sufficiently so that it will fit in place easily. And on warming up to room temperature again, it will expand to fit tightly into its frame.

Ray Baldwin, Laurel, Miss.

Square Prevents Handsaw Binding

When ripping a board with a handsaw, binding can be prevented if a try square or combination square is slipped into the kerf. The flat blade of the square will keep the saw cut spread and yet when loose will not fall from the slot.

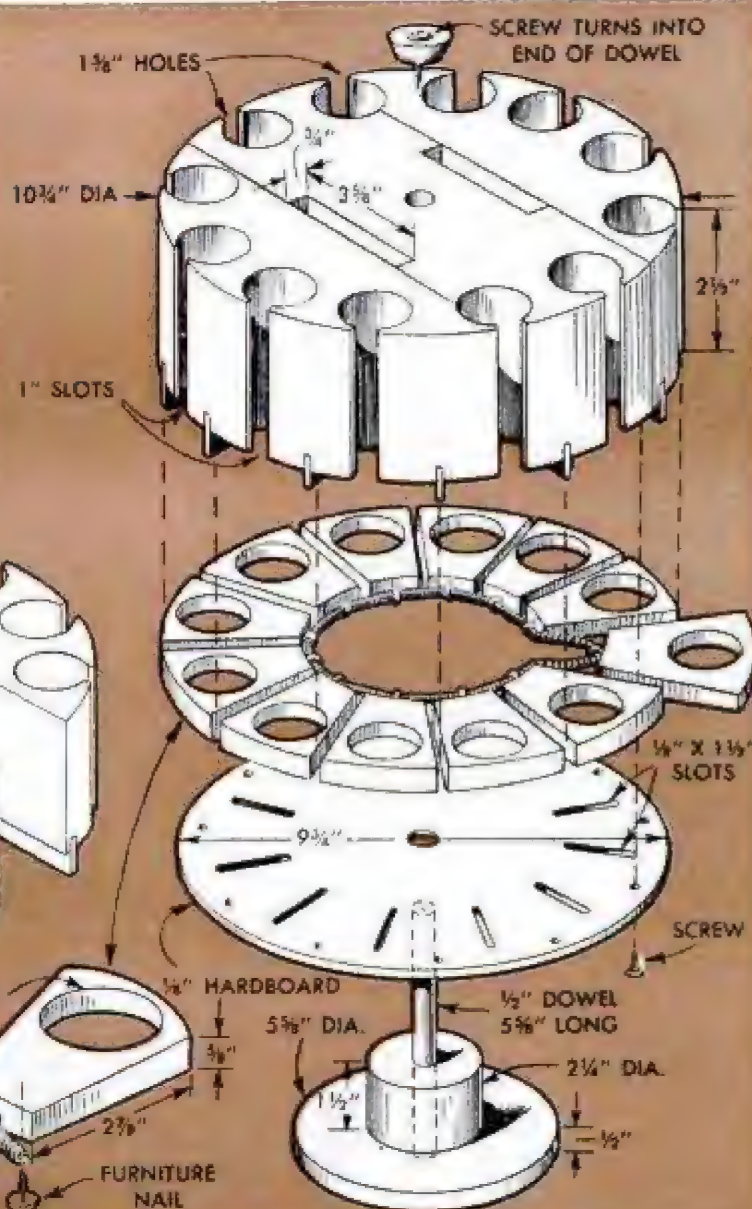
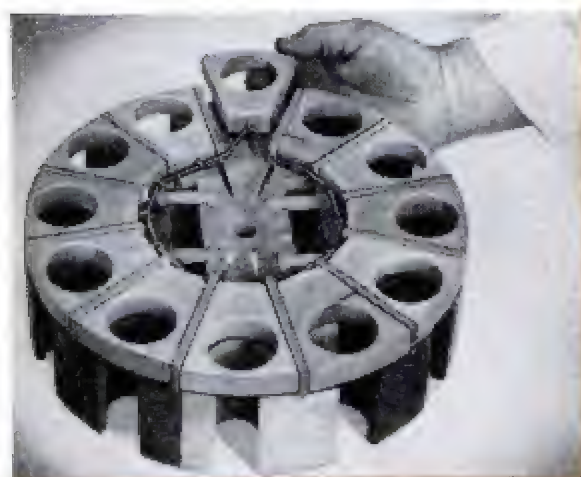
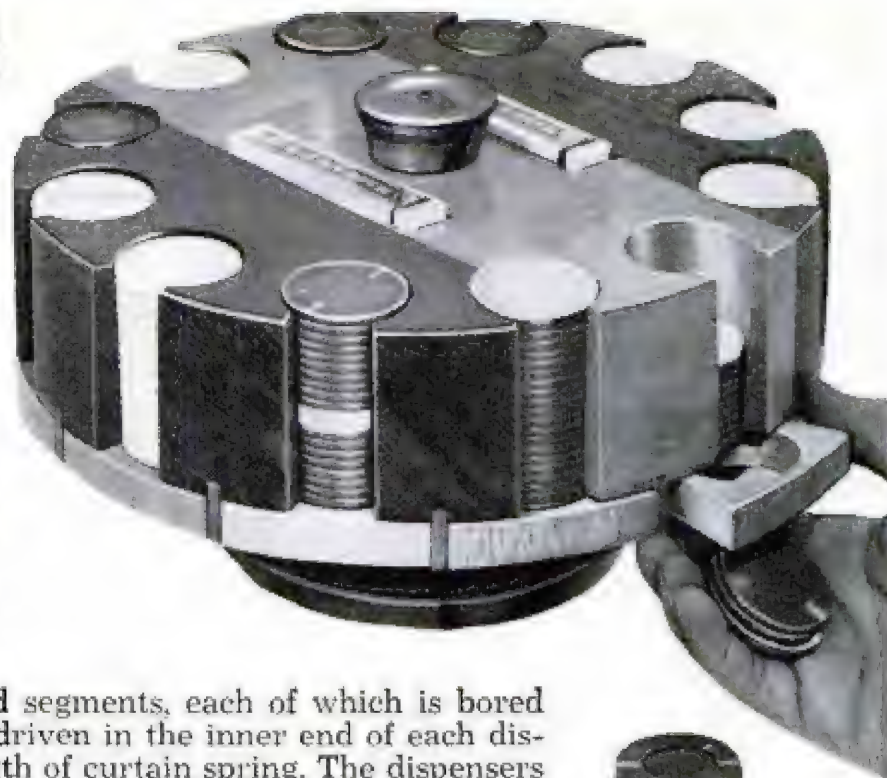
Joel Miles, Denver, Colo.



DISPENSER FOR POKER CHIPS

By W. G. Waggoner

ADDING UNIQUE pull-out trays to the bottom of this hardwood poker-chip rack transforms it into a time-saving dispenser that counts out chips five at a time. The dispensing mechanism consists of a dozen wedge-shaped segments, each of which is bored for the chips. A screw eye is driven in the inner end of each dispenser and threaded on a length of curtain spring. The dispensers are held in position by means of a hardboard disk and thin wooden separators. Furniture nails driven through slots in the disk permit pulling out the spring-loaded dispensers with the finger tip.



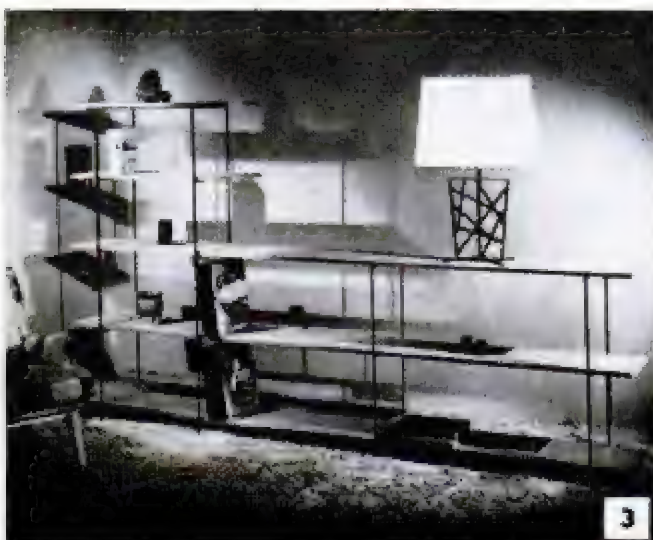
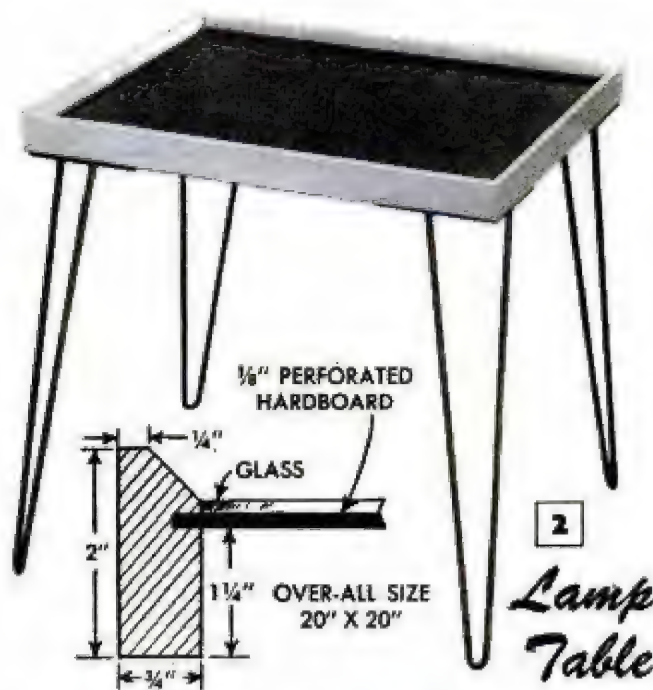
THE JOB'S HALF READY-MADE



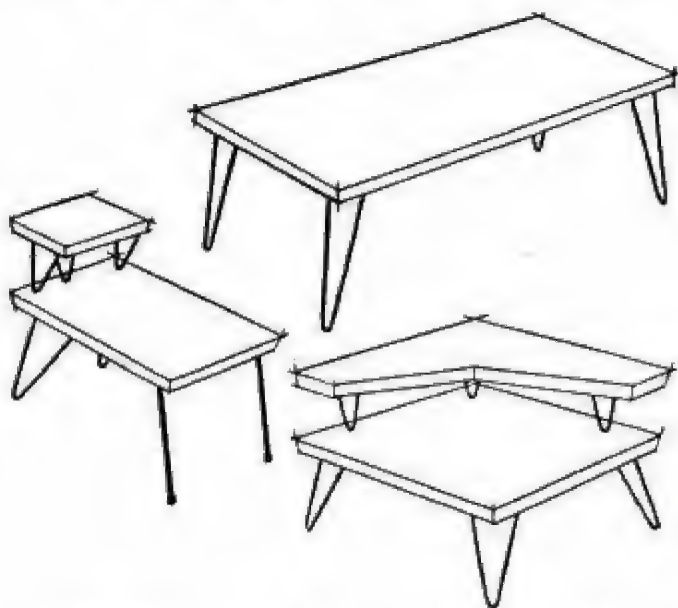
By Wayne C. Leckey

WANT TO BUILD a table with a screwdriver? You can do just that with ready-made steel legs—a new idea that equips the home furniture builder with prefabricated units, complete with screws, ready for attaching. For example, with a set of these modern steel legs, anyone can build a sturdy, smart-looking dinette table in little more than the time it takes to screw them to a flush-type door. By attaching them directly to a table-model TV set, Fig. 1, a smart wrought-iron stand is had that is right at home with modern furnishings. These are but two of any number of simple applications to which these practical legs can be put. Bookcases, chests, hollywood beds, desks and chairs are other uses.

The legs come in various lengths, shapes



DONE WITH STEEL LEGS

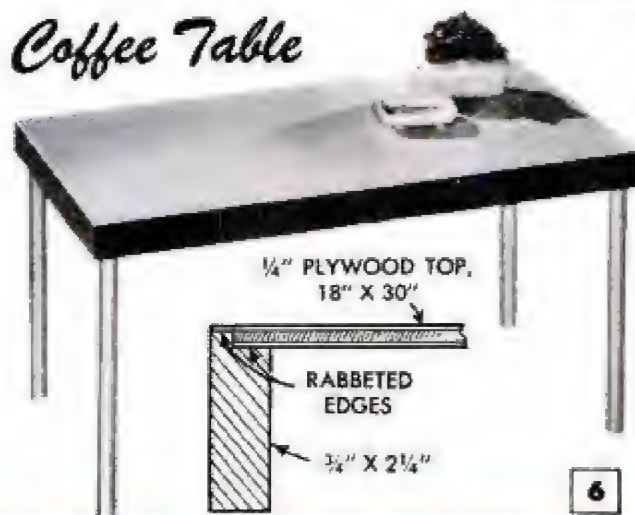


and finishes, Fig. 9. In addition to black-finish hairpin legs, there are tubular ones in brushed chrome and plain, standard wrought-iron ones tipped with rubber. Still others in the form of welded frames are available for making room dividers, Figs. 3 and 4. Room dividers are the latest trend in flexible room arrangements and, as in the case of the legs, the welded frames are simply screwed to wooden shelves and the job is done. Similar frame units are available for making end tables and wall shelves as pictured in Figs. 10 and 11.

The popular hairpin-design leg can be



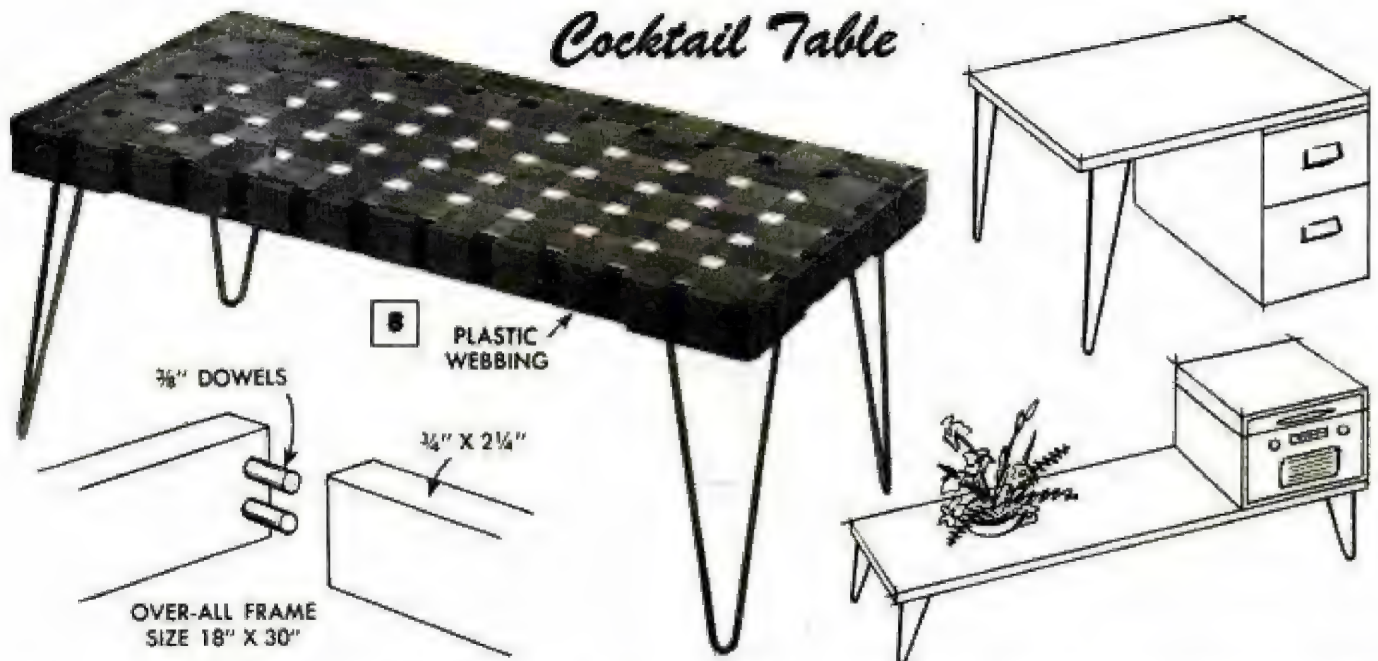
Coffee Table



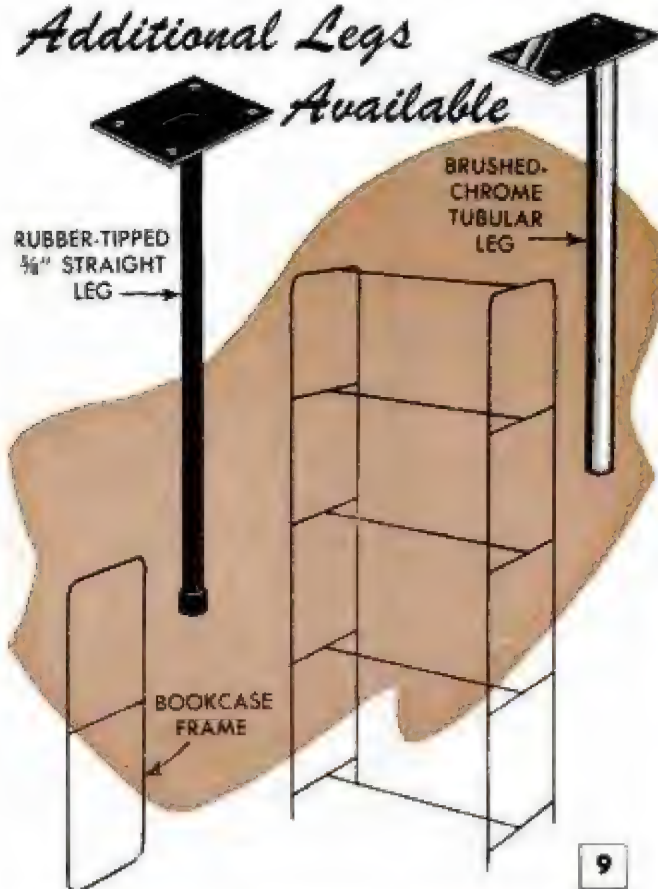
HAIRPIN LEG



Cocktail Table



Additional Legs Available



had in some seven different lengths, 6, 9, 12, 14, 16, 22 and 28 in. The 12-in. size, suitable for a coffee table, averages about \$7.00 per set of four legs. Other sizes are proportionately priced. Aside from their ease of application, the particular design of the hairpin leg helps to strengthen any framework table top to which they might be attached, Fig. 5, and while the longer sizes might appear to be somewhat frail looking, the outward flare of the legs actually tends to add exceptional rigidity.

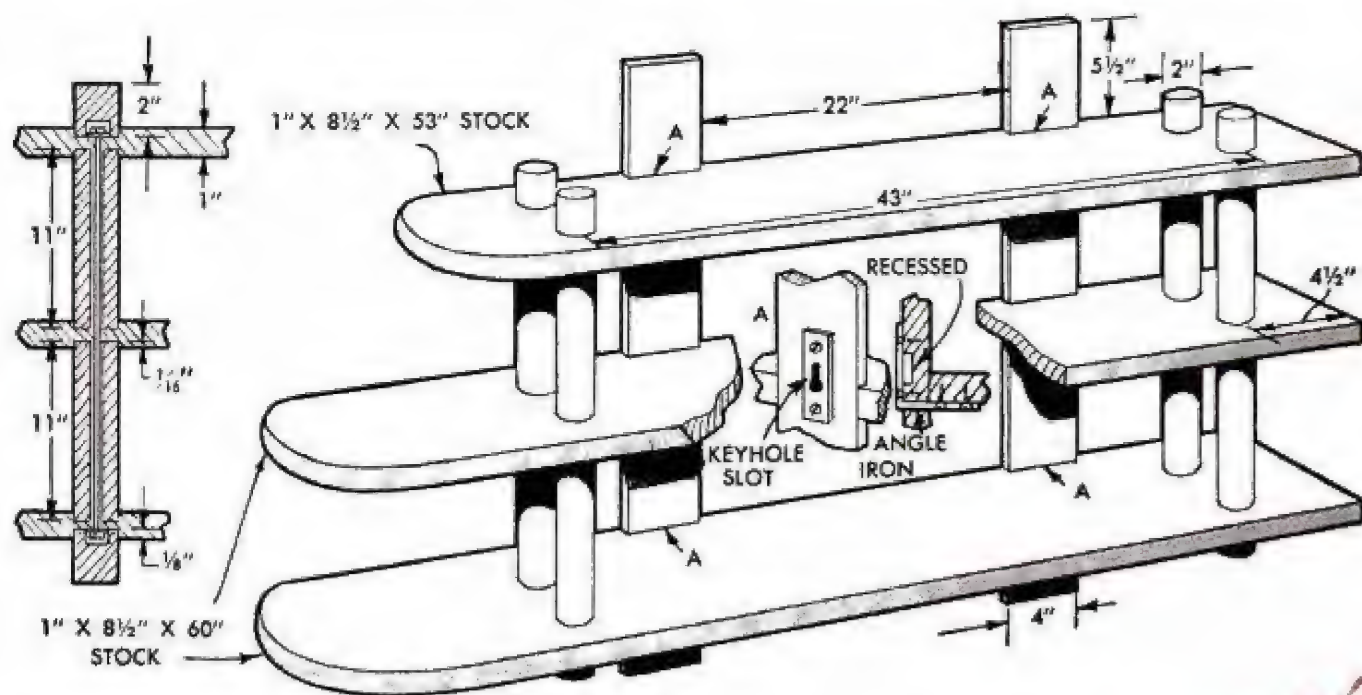
The tables pictured in Figs. 2, 6, 7 and 8 detail several attractive table tops which the home craftsman can build for hairpin legs. The table shown in Fig. 2 is nothing more than a mitered "picture frame" assembly fitted with a panel of leather-textured hardboard. In Fig. 7, the wooden top has been covered with gray-linen decorative laminate. An article in the October 1952 issue of *Popular Mechanics* describes how this material is applied. The cocktail table, Fig. 8, consists of a simple rectangular frame of hardwood, painted flat black and woven with Chinese-red plastic webbing, laced and tacked to the frame. ★ ★ ★

Information and certain photos courtesy E. F. Lawrence Iron Works



HANGING BOOKSHELF

Useful for books as well as knickknacks, this hanging wall shelf fills the bill perfectly where floor space is limited. Keyhole slots in metal L-brackets permit the shelf to be hung securely from round-headed screws driven in the wall. The 2-in. posts separating the three shelves are turned and cut to the lengths indicated in the sectional drawing. The two 11-in. sections of the posts are drilled to receive $\frac{1}{4}$ -in. rods which tie the assembly together. Note that the sections rest in counterbored holes.—Richard N. Nierenberg, Dayton, Ohio

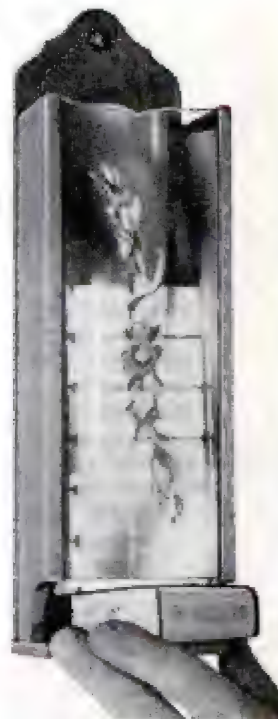
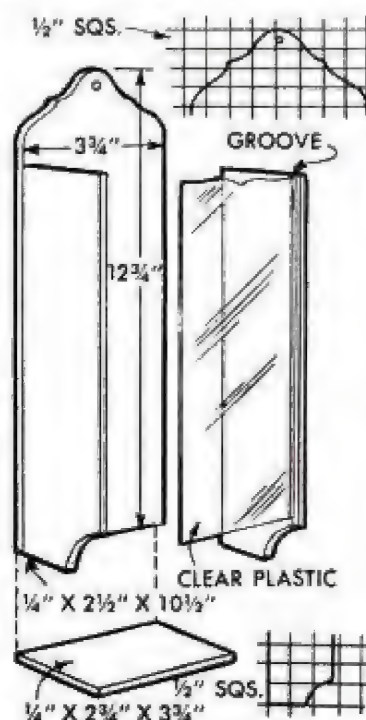


Dispenser for Cigarette Packs Keeps Supply Visible

WTM 55

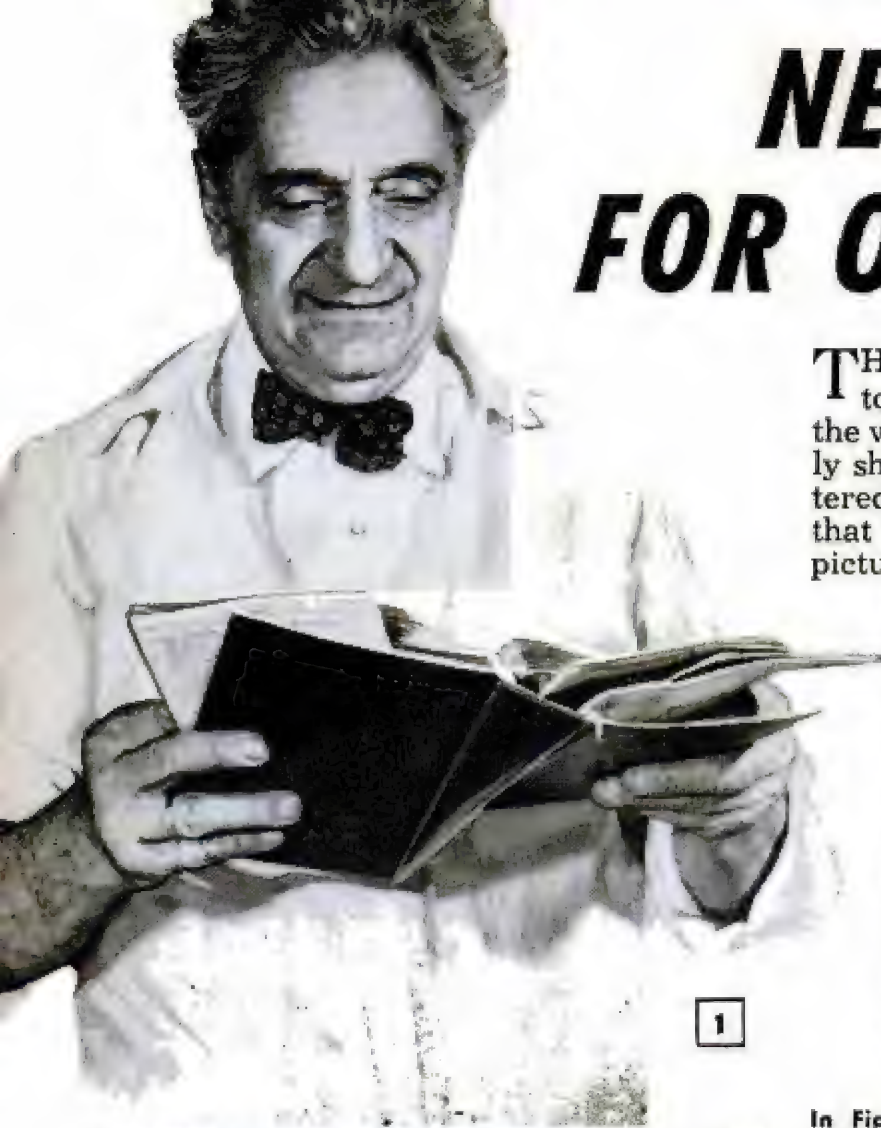
Hang this cigarette-pack dispenser on your kitchen wall and you'll know at a glance when the supply is getting low. The back, sides and bottom of the dispenser are made from $\frac{1}{4}$ -in. stock, cut as shown in the detail. The two sidepieces are grooved to receive the plastic sheet which forms the front of the dispenser. The plastic front should be cut a little oversize, so that the sidepieces have to be bent slightly outward to accommodate it. If fitted tightly in this fashion, the plastic will stay in place without further support. Since the dispenser is to be mounted on a wall, it should be finished in a decorative manner. It can be lacquered to match the other colors used in the room, or it can be stained to simulate one of the hardwoods. Decals can be used on the plastic front or on the sides.

Bertram Brownold, Cedarhurst, N. Y.



Aluminum foil wrapped around a tree trunk protects it from rabbits.

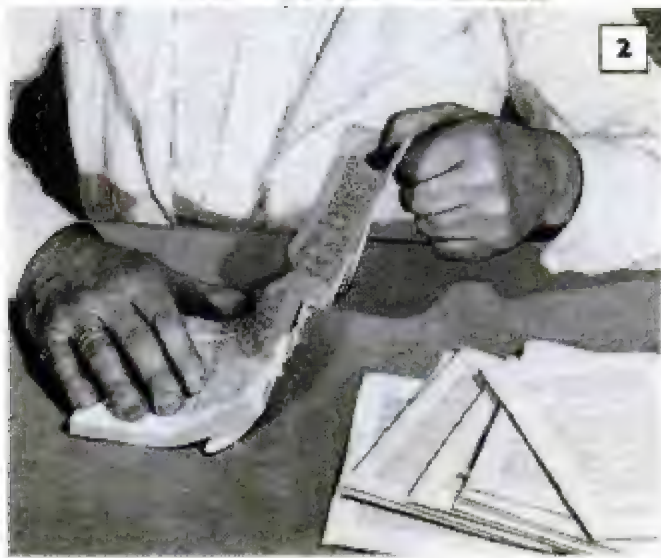
NEW LIFE FOR OLD BOOKS



1

THE POWER of the printed word is said to be eternal, but the bindings in which the words are preserved have comparatively short lives. If you have broken and battered books on your shelves, you will find that by following the simple steps in these pictures you can give them new life and restore their appearance. Eric Hollander, a New York City bookbinder, shows you how it's done. The materials required are inexpensive and easy to obtain. The most unusual item is a book press, but a vise will do just as well. Other than that, all you need is a paste pot, a pair of scissors, some bookman's (or No. 25 linen) thread and a paper cutter, if one is available. Stiff paper and poster board complete the list. The most ticklish part of the job is taking the book apart without further damaging it. The rest is easy. ★ ★ ★

In Fig. 1, the bookbinder holds a volume that is falling apart and badly in need of rebinding. The book must now be taken apart without doing any further damage to the pages. Cover is removed first



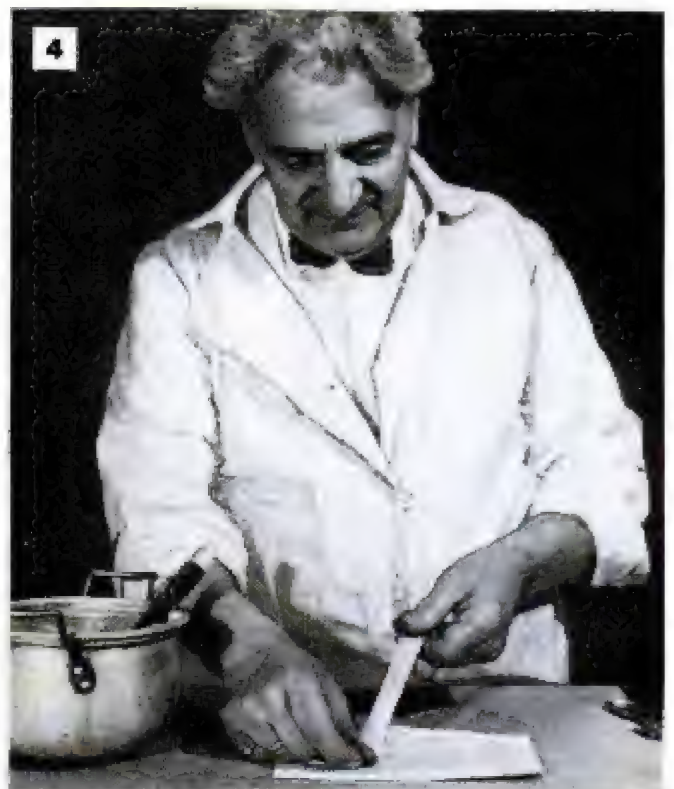
2

After the cover is taken off, individual sections of the book are slit from their threads and gently pulled out of the binding, as in Fig. 2. The sections should be kept intact and handled carefully

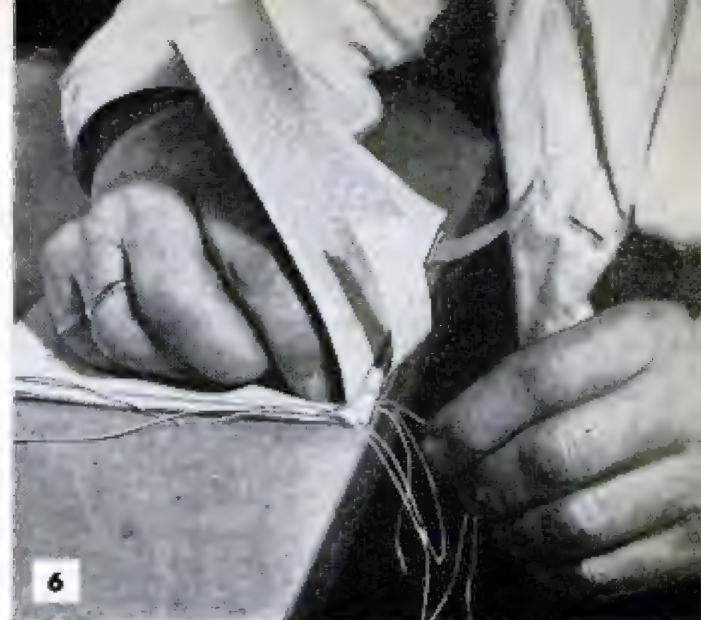
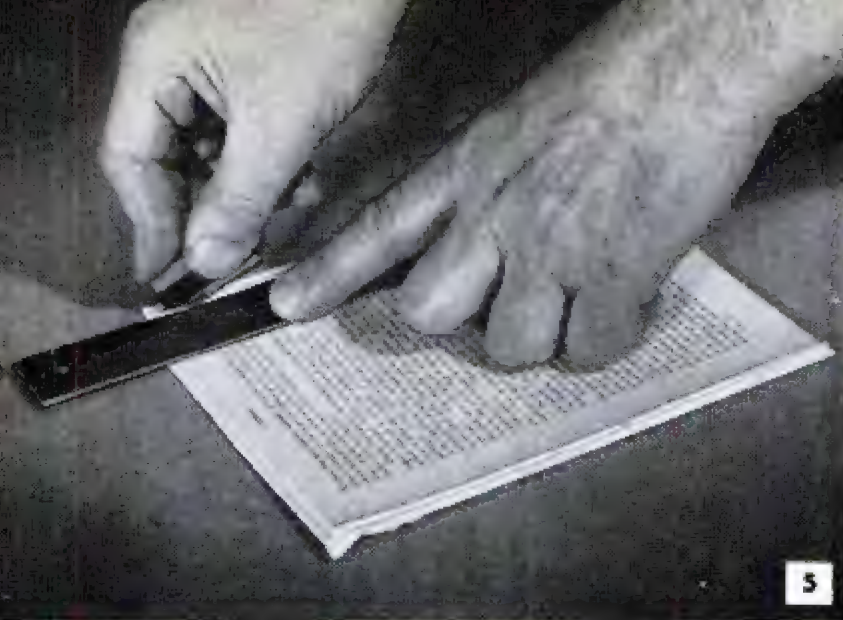
Below, in Fig. 3, the individual sections are cleaned with a knife, leaving them smooth and free for re-binding. Then any damaged pages are repaired with transparent tape, as the book-binder is doing in Fig. 4



3



4



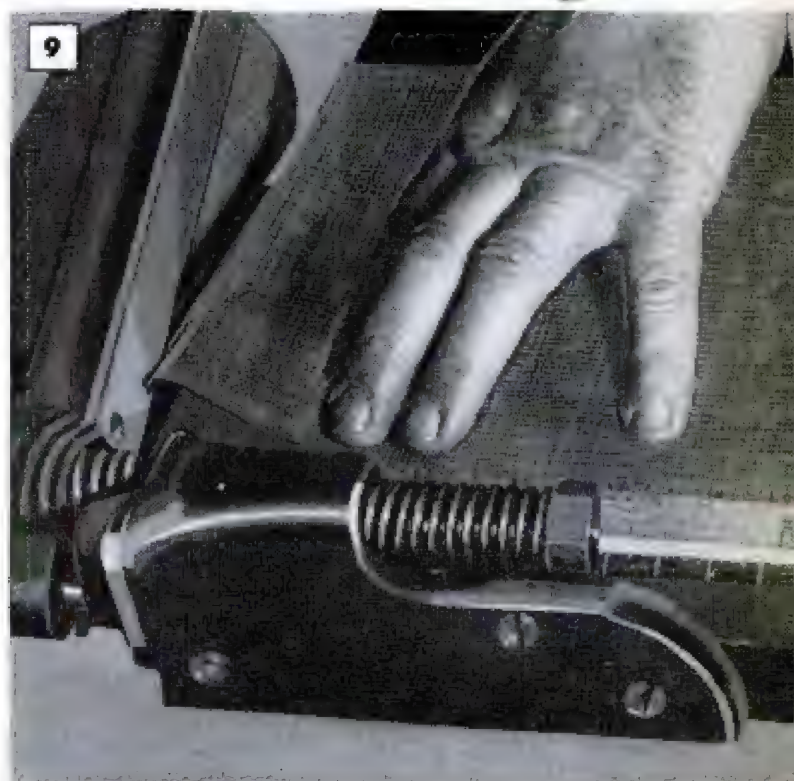
A sheet of stiff paper is doubled and then cut to the exact page size, Fig. 5, to make a cover plate. The creased edge, placed along the back of the book, is not cut. Two cover plates like this are required

Now sew sections of book together. Two strips of crinoline wrapped around back are sewn to book as in Fig. 6. Stitches are put through crease of each section, then run to next section in continuous stitch

The cover plates, which previously have been cut to size, are now placed on the front and back of the book, Fig. 8, and crinoline tabs glued on top of them, binding them to the pages. Apply the glue carefully

A strip of kraft paper, wide enough to cover both the back of the book and the crinoline tabs on both sides, is now glued in place. It should be shorter than the book back. Book is then clamped in press to dry, Fig. 7

Fig. 9 shows the cloth for the cover being cut. One piece is used, measuring $1\frac{1}{2}$ in. longer and wider than the final dimensions of the cover itself to allow for wrapping around the edges of the cover boards





10

The front and back cover boards are now cut from heavy cardboard stock, Fig. 10. These should measure $\frac{1}{4}$ in. longer than the page length, but should be exactly the same width. A backing strip, the same length as the cover boards and slightly wider than the book back, should be cut from the same material



11

The cover cloth is laid out flat, as indicated in Fig. 11, and the cover boards and backing strip are placed on it. Space must be allowed on both sides of the backing strip for bending the cover. When lined up, the cover boards and backing strip are glued to the cloth. Edges are wrapped and glued

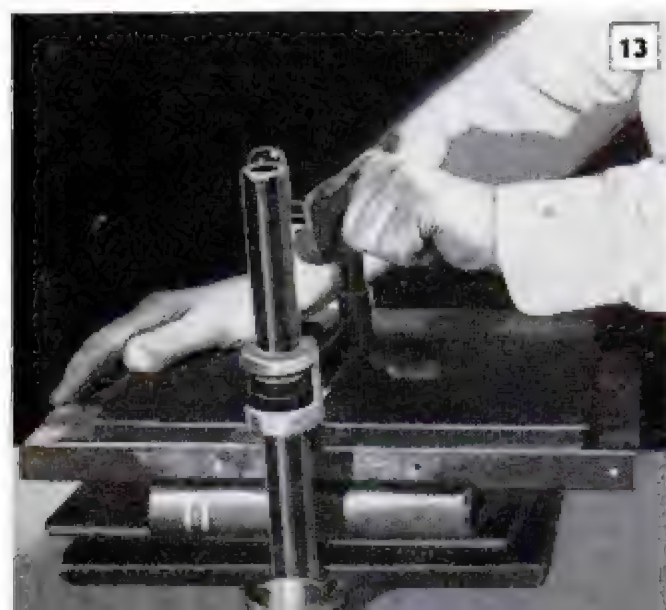
Glue is carefully applied to one cover plate with a brush, Fig. 12. Then the book is pressed on the already prepared cover. Next, glue is spread on the second cover plate and the cover is wrapped around the book and pressed in place. Carelessness at this point of the work will smear glue, causing a messy job

To finish the rebinding job, place the book in a press under heavy pressure overnight, Fig. 13. By morning the glue will have dried thoroughly, and you will have a new-looking book for your library shelves. Instead of cloth, the cover can be leather, leatherette or plastic, if a more luxurious look is wanted



12

Eric Hollander views the rebound volume in Fig. 14. The title of the book can be hand-lettered on the new cover in gold or a bright color. Or, as is frequently done, it may be lettered or printed on small rectangles of heavy-weight paper, which then are glued to the front cover and to the back strip



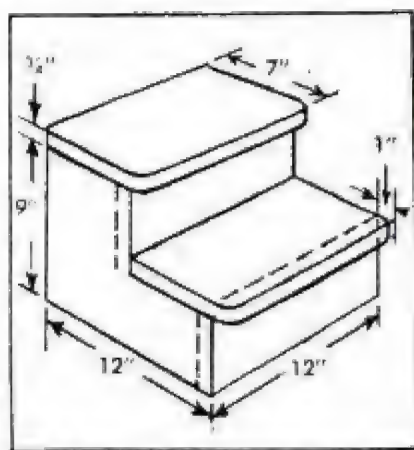
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14

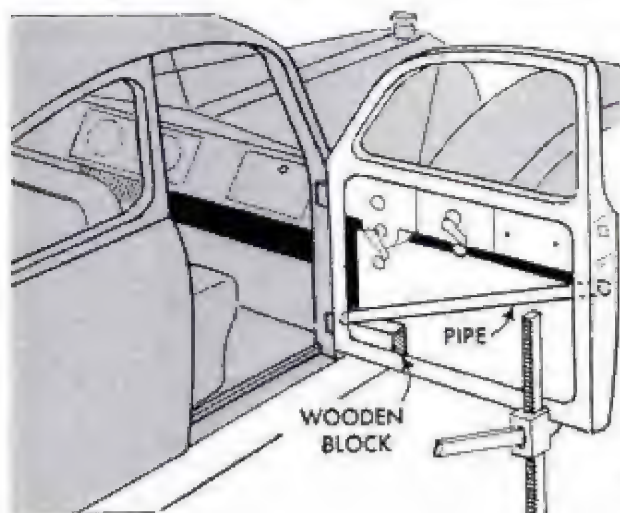
Steps Help Child Learn to Use Clothes Closet

Children can't be trained to hang their clothes in a closet until they are tall enough to reach the clothes pole, unless you provide them with a means of getting up in the closet. A pair of steps which can be their very own property will do the trick and go far toward training them to be neat about their clothes. These steps are easily moved around his room by the child, and while they are high enough so he may reach his clothes, they are not so high as to be dangerous. Constructed of $\frac{3}{4}$ -in. lumber and fastened together with wood screws, the steps are an easy one-evening project for the home craftsman. All the necessary dimensions



are given in the detail. When completed, the steps can be finished to match the other furniture in the room.—I. M. Fenn, Chicago.

Emergency Repair for Rusted Door Hinges of Old Automobiles



When the lower hinge on the door of an older automobile rusts out, it often can be repaired even though excessive rust prevents welding. First remove the upholstery from the inside of the door, and then, with the door wide open, jack up the outside corner until the broken hinge is in its original position. Measure the distance between the two lower corners of the door on the inside of the frame and cut a length of $\frac{1}{2}$ -in. pipe, making it $\frac{1}{4}$ in. longer than this measurement. Wedge this pipe inside the door, as shown, with one end against the center of the broken hinge and the other against the opposite side. To prevent the pipe from slipping, insert a block of wood under it.

Robert E. Damm, Englewood, Colo.

Worn Spot on Auto Armrest Renewed With Flock

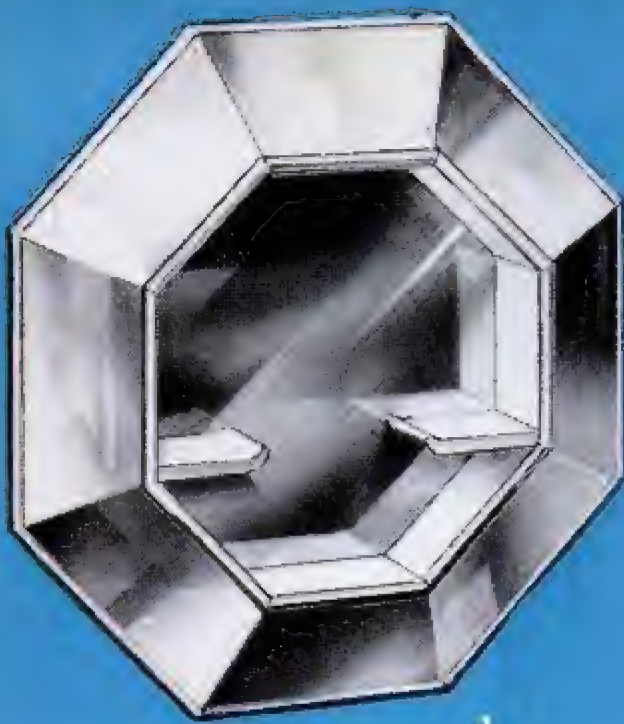
When the upholstery on the armrest of your car becomes worn, it can be repaired by spraying it with flock of the same color as the upholstery. Remove the armrest from the door, trim off the worn edges of the material, and glue down any loose edges. Spray or lightly brush a thin layer of flock undercoating on the exposed area and, when it is tacky, apply the flock, either with a flock gun or by sifting through a fine sieve. The result will wear well.

Ken Murray, Colon, Mich.

☞ Your name printed on a strip of adhesive tape can be wrapped around the shaft of an umbrella to serve as identification.



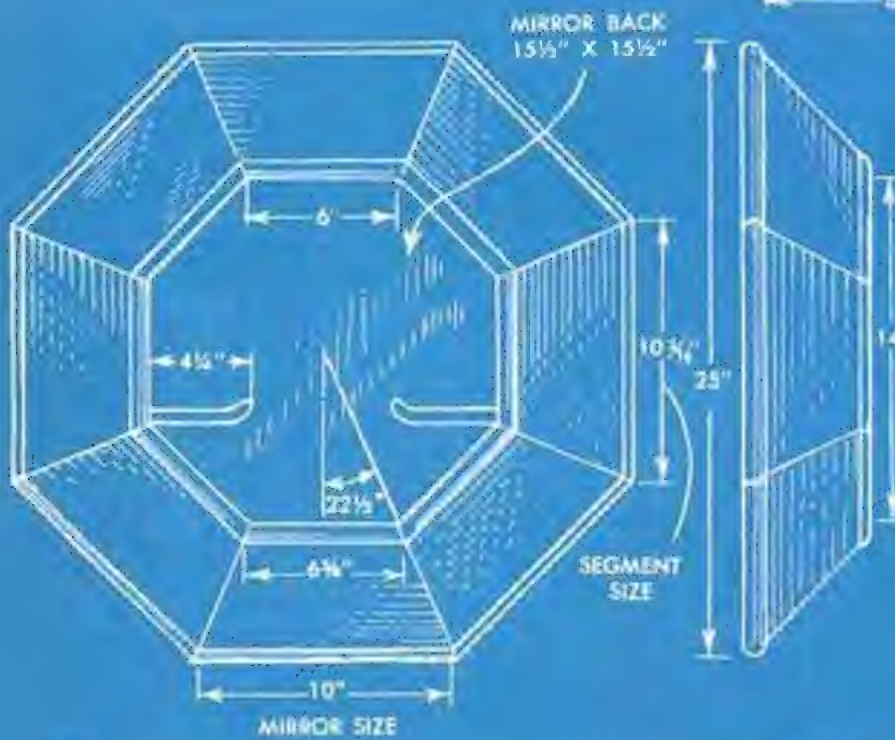
PLAN of the MONTH...



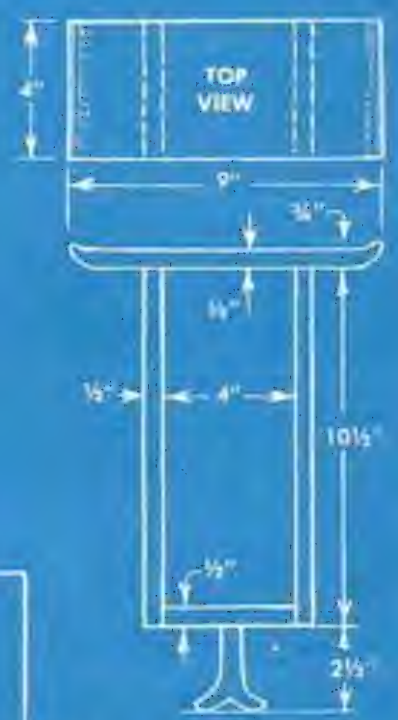
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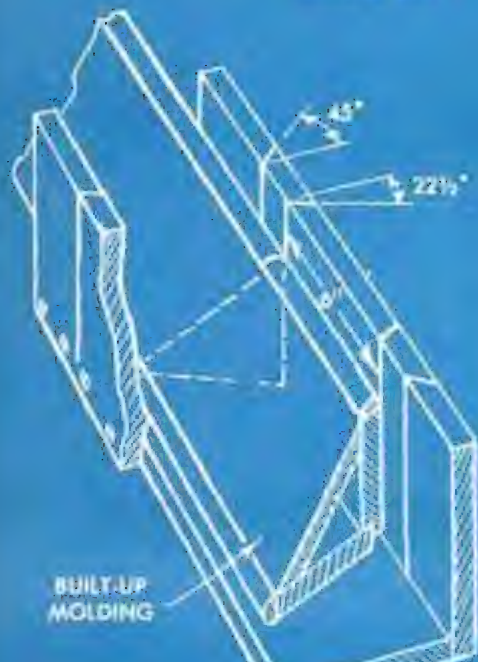
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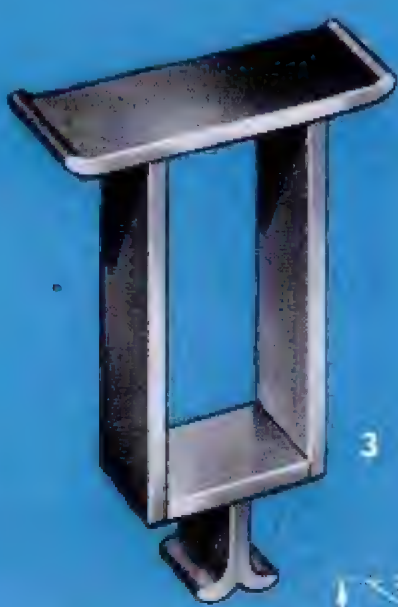
TOP VIEW



TOP VIEW



BUILT-UP MOLDING



3



HOMEMADE

Shadow Boxes

Modern Furniture

Box No. 1

Plywood

- 1 pc.— $\frac{1}{4}$ " x $15\frac{1}{2}$ " x $15\frac{1}{2}$ "—Back
8 pcs.— $\frac{1}{2}$ " x $5\frac{21}{32}$ " x 10 "—Sides

Lumber

- 8 pcs.— $\frac{3}{4}$ " x $4\frac{1}{2}$ " x $6\frac{3}{8}$ "—Inside sides
8 pcs.— $\frac{3}{4}$ " x $4\frac{3}{8}$ " x 10 "—Frame backs
8 pcs.— $\frac{3}{8}$ " x $\frac{3}{4}$ " x $6\frac{3}{8}$ "—Half rounds (face)
8 pcs.— $\frac{3}{8}$ " x $\frac{3}{4}$ " x $10\frac{5}{16}$ "—Half rounds (sides)
2 pcs.— $\frac{3}{4}$ " x $4\frac{1}{2}$ " x $4\frac{1}{4}$ "—Shelves

Mirrors, Single Strength

- 8 pcs.— $5\frac{21}{32}$ " x 10 "—Sides
1 pc.— $15\frac{1}{2}$ " x $15\frac{1}{2}$ "—Back

Box No. 2

Lumber

- 1 pc.— $\frac{1}{2}$ " x $3\frac{1}{2}$ " x $15\frac{1}{2}$ "—Center
2 pcs.— $\frac{3}{4}$ " x $3\frac{1}{2}$ " x $4\frac{1}{2}$ "—Shelves
4 pcs.— $\frac{3}{4}$ " x $3\frac{1}{2}$ " x $3\frac{3}{4}$ "—Shelves

Box No. 3

Lumber

- 1 pc.— $\frac{3}{4}$ " x 4 " x 9 "—Top
2 pcs.— $\frac{1}{2}$ " x 4 " x $10\frac{1}{2}$ "—Sides
1 pc.— $\frac{1}{2}$ " x 4 " x 4 "—Bottom
1 pc.— $1\frac{3}{4}$ " x $2\frac{1}{2}$ " x 4 "—Ornament

Box No. 4

Plywood

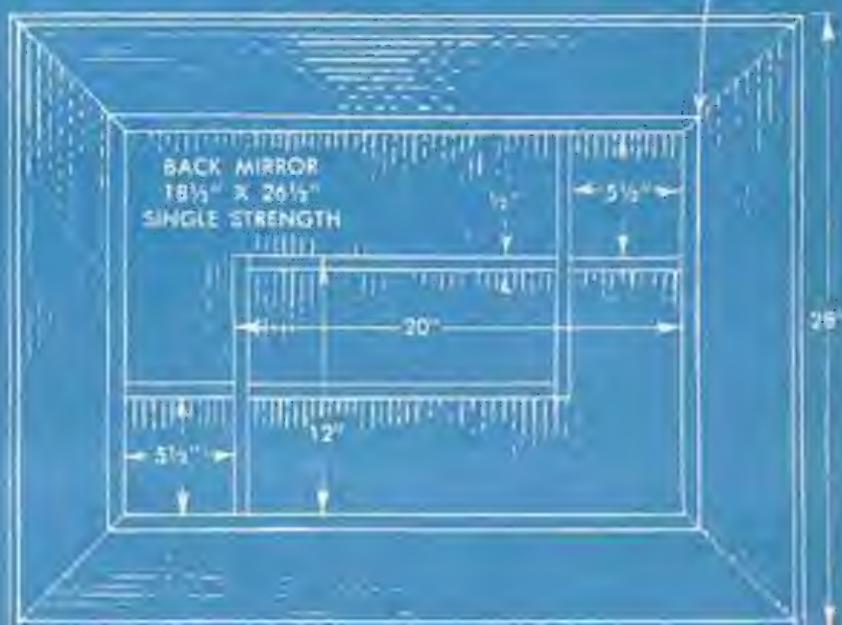
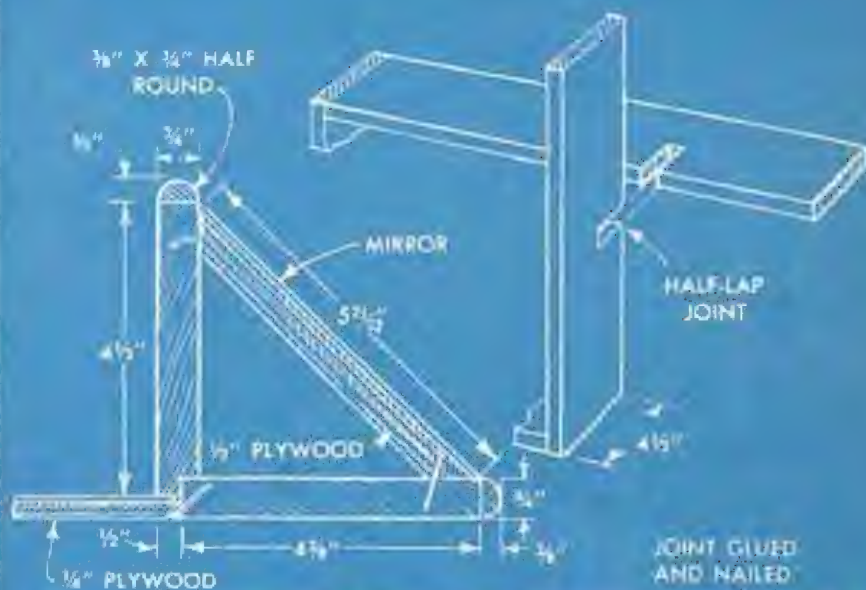
- 1 pc.— $\frac{1}{4}$ " x $18\frac{1}{2}$ " x $26\frac{1}{2}$ "—Back
2 pcs.— $\frac{1}{2}$ " x $5\frac{21}{32}$ " x $27\frac{1}{4}$ "—Sides
2 pcs.— $\frac{1}{2}$ " x $5\frac{21}{32}$ " x $35\frac{1}{4}$ "—Sides

Lumber

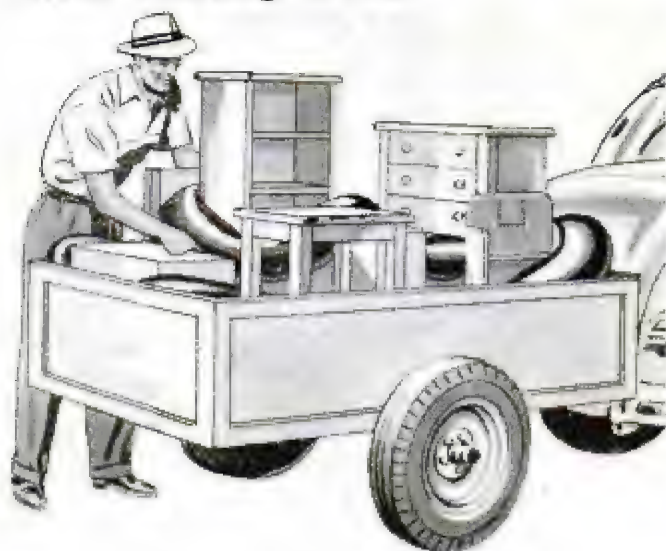
- 2 pcs.— $\frac{3}{4}$ " x $4\frac{3}{8}$ " x $27\frac{1}{4}$ "—Side back frame
2 pcs.— $\frac{3}{4}$ " x $4\frac{3}{8}$ " x $35\frac{1}{4}$ "—Top and bottom back frame
2 pcs.— $\frac{3}{4}$ " x $4\frac{1}{2}$ " x 19 "—Sides
2 pcs.— $\frac{3}{4}$ " x $4\frac{1}{2}$ " x 27 "—Sides
2 pcs.— $\frac{3}{8}$ " x $\frac{3}{4}$ " x 19 "—Half rounds (face)
2 pcs.— $\frac{3}{8}$ " x $\frac{3}{4}$ " x 27 "—Half rounds (side)
2 pcs.— $\frac{3}{8}$ " x $\frac{3}{4}$ " x 28 "—Half rounds (side)
2 pcs.— $\frac{1}{2}$ " x $4\frac{1}{2}$ " x $19\frac{1}{2}$ "—Shelves
2 pcs.— $\frac{1}{2}$ " x $4\frac{1}{2}$ " x 12 "—Partitions

Mirrors, Single Strength

- 2 pcs.— $5\frac{21}{32}$ " x $27\frac{1}{4}$ "—Sides
2 pcs.— $5\frac{21}{32}$ " x $35\frac{1}{4}$ "—Sides
1 pc.— $18\frac{1}{2}$ " x $26\frac{1}{2}$ "—Back



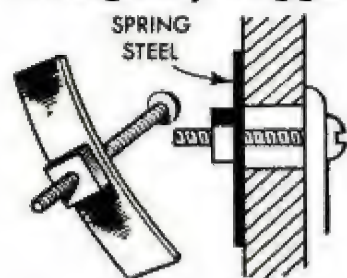
Inner Tubes Protect Furniture When Packing Trailer



Inflated inner tubes make excellent cushions for protecting easily scratched and damaged furniture when packed in a trailer or truck for moving. For ease of packing, stretch the tubes around the furniture while uninflated. When the furniture is in place, inflate the tubes until they expand sufficiently to fill the space between the articles, thus holding them safely apart. The flexibility of the tubes allows them to be used around irregular shapes, and for a large piece of furniture, several can be tied together to make a buffer.

Emil T. Settlege, Los Angeles, Calif.

Emergency Toggle Bolt



An emergency toggle bolt that will support light objects can be made simply by cutting a strip of light-steel banding of the type used to band packing

crates and drilling a hole in the strip to take a stove bolt. When inserting the bolt in the hole in the wall, the ends of the spring steel are held together. When inside the wall, the banding straightens out and expands in back of the hole, thus allowing the bolt to be tightened.

Cornstarch-and-Paint Mixture Used to Patch Cracks

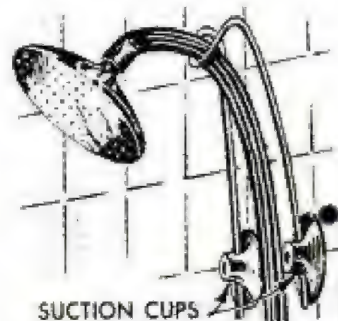
A small amount of the paint intended for use on a wall can be mixed with cornstarch to make a putty for filling cracks before painting. Cornstarch is added to the paint until the mixture is stiff enough to spread with a putty knife. Ordinarily it is not necessary to wait until the patched spots dry

before painting over them. But if the cracks or holes are large, they should be filled and allowed to dry so they can be sanded smooth before the paint is applied.

Harry J. Miller, Sarasota, Fla.

Bath Spray in Holder Makes Shower for Tub

You can install a shower in your bathtub without the expense of installing plumbing fixtures, simply by supporting a bath spray in the holder shown. The holder is made by bending heavy wire to shape and



then inserting the ends in two large rubber vacuum cups. In attaching the vacuum cups to the wall, note that they will hold better if the inside of the cup is rubbed with soap before being pressed to the wall.

Carl S. Bates, Chicago.

Pipes Used as Leveling Stakes When Building Footing Forms

Grade-leveling stakes for footings that are not easily knocked out of line can be made from 2-ft. lengths of pipe. The pipe stakes are driven into the ground along the center line of the proposed footings, at about 12-ft. intervals. They are driven in until their tops will just come flush with the point where the tops of the forms will be. They then can be used as a guide for a spirit level when setting up the forms, as shown in the photo. If a transit cannot be borrowed from an engineer or surveyor friend, it will pay the amateur builder to hire a professional to set the stakes level. This will assure greater accuracy in leveling the footing, foundation and house.

Peter G. Gordon, Ontario, Can.



⚠ Air bubbles appearing in the glass bowl of the fuel pump indicate there is a leak in the gas line between the tank and the pump.

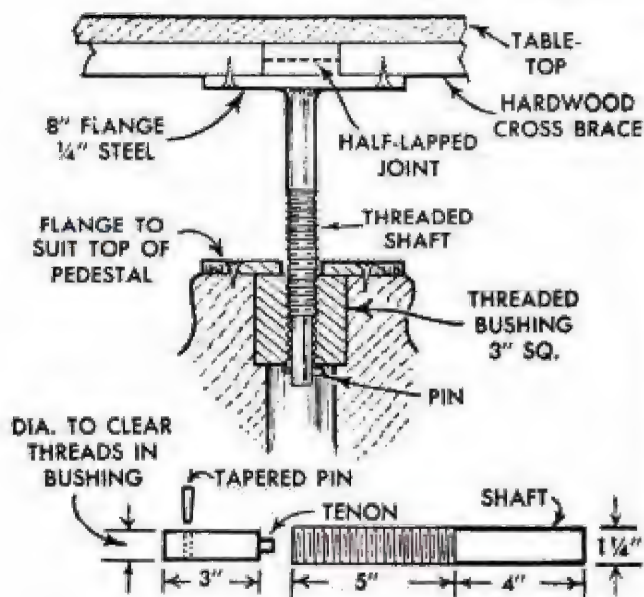


TWO-LEVEL TABLE

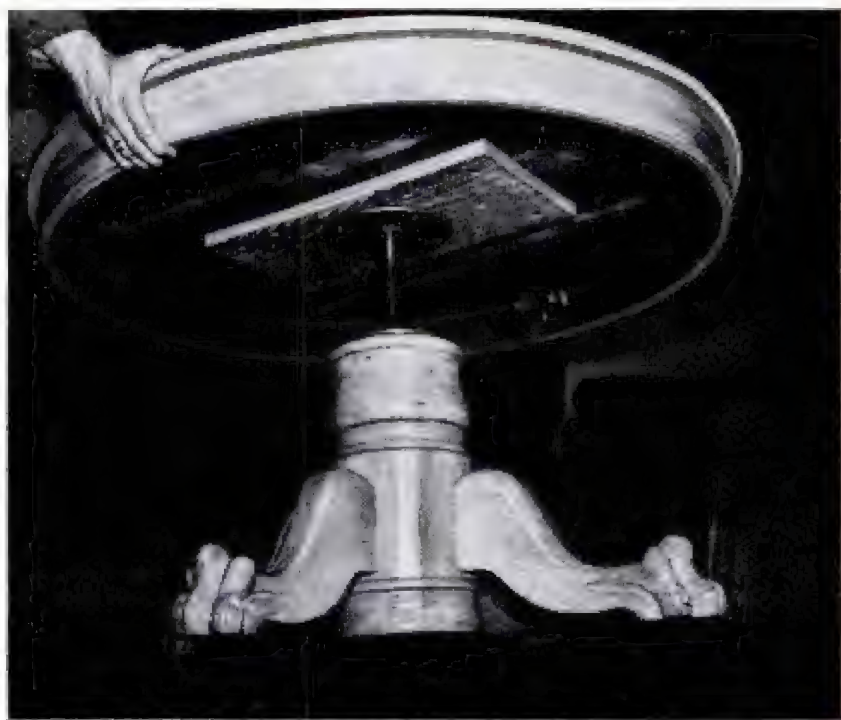
By Charles E. Duval

LIKE THE OLD-TIME piano stool that was rotated to raise or lower, this revamped round, oak dining table is made to serve as a low cocktail table or a convenient card table by merely twirling the top. Many of these popular old tables, now an eyesore with modern furnishings, can be brought back from the attic and transformed into smart, good-looking pieces of highly functional furniture. Essentially, the conversion

job consists of cutting off a portion of the hollow pedestal and embedding a threaded bushing in the top. A large "washer" is used to hold the bushing in place in the manner indicated in the drawing. The screw is machined and threaded from 1 1/4-in. steel which is welded to a steel plate for fastening to the table top. Note that the travel of the screw is limited by an extension and crosspin.



Note diameter of extension, which is a press-fit in end of screw, is smaller than screw to permit passage of extension through bushing

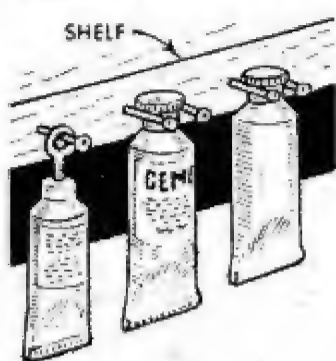


Striker Board Is Self-Aligning On Concrete Sidewalk Forms



This self-aligning striker board was made by one contractor to overcome the difficulty of holding the regular straight-edge vertical when striking off the finish coat of concrete on sidewalk jobs. Two straight edge boards are fastened together in the center and held apart at both ends by large spacers which serve as convenient handles when using the striker. The spread of the boards at the end, resting on the forms, keeps the striker standing on edge. The curve of the bow also keeps the concrete running to the middle instead of spilling over the edges of the forms.

Nails Hold Tubes at Shelf Edge



To prevent tubes of glue and household cement from being misplaced, store them between finishing nails driven in the edge of a shelf. Tubes having key-type stoppers can be hung from a single nail.

Fur Garments May Be Damaged When Stored in Home Freezer

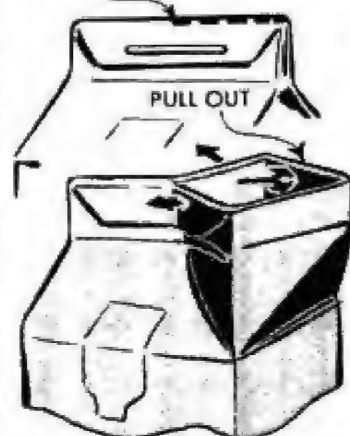
Fur garments that have been stored in a home freezer usually are found to be creased and crushed upon removal, in which case glazing or other treatments will be necessary to raise and straighten the fur. If a pelt has been frozen stiff, it very likely will be cracked at the folds, especially if any weight such as packaged foods has been placed on or against it. There also

is the possibility of damage due to dampness, either in the freezer or when the fur is in the process of thawing. Dampness may cause aging, fading, loss of lustre or mildewing. On the other hand, fur garments preserved in commercial cold-storage warehouses have the advantage of being hung loosely to permit air to circulate freely around them, while temperatures and humidity are carefully regulated and kept under constant check.

Pouring Spout for Milk Carton

A pouring spout for cardboard milk cartons of the type shown that will eliminate dripping and spilling, and allow the carton to be drained completely, can be made by slitting the ridge of the carton and pulling out the fold under the ridge. To re-seal the carton, simply push the flap back to its original position. On most cartons, this can be done without removing the staple, but a few have a long staple, which interferes if not removed.

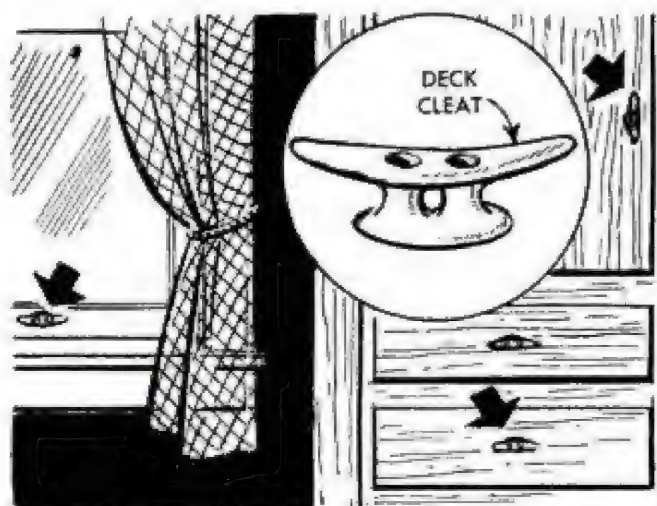
CUT ON DOTTED LINE AND FOLD BACK



W. Dyre Doughty, Tucson, Ariz.

Deck Cleats Give Nautical Touch To Den or Recreation Room

If you are planning a nautical theme in the decoration of your den or recreation room, use deck cleats for door handles, drawer pulls and window lifts to help carry out the idea. These are available in various sizes and can be purchased in any marine-supply house. The cast-brass type are the most colorful for this use. They can be buffed to a high polish and coated with clear shellac to prevent discoloration.



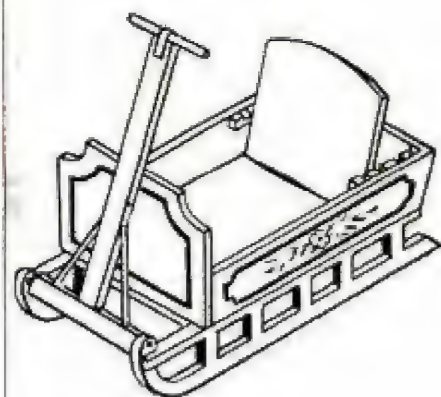
Christmas Toys

By
Hi Sibley

SURPRISINGLY SIMPLE to build, the wooden toys shown on these pages add up to something really special under the tree on Christmas morning. And they'll save you money, too—an especially pleasant prospect with Christmas approaching—as the few dollars worth of wood and paint involved in their construction amounts to a bare fraction of what toys of similar quality would cost in a store.

The sled detailed on the following page is modeled after the sturdy pungs used in maple-sugar camps. The runner assemblies are of hardwood or pine, while the box is of $\frac{1}{2}$ -in. exterior plywood or $\frac{3}{4}$ -in. pine lumber. The runners consist of top and bottom rails mortised to receive tenons cut on the ends of 1-in.-sq. vertical separators. The curved front section of each runner is bandsawed to shape and fastened to the end of the lower rail with a scarfed joint, using waterproof glue and countersunk screws as in the lower left-hand detail. Note how the top rail and the upper section of the curved front are notched to provide a half-lapped joint. The separator tenons are glued and pinned into the rail mortises. The underside of each runner is covered with $\frac{1}{16}$ x 1-in. flat steel, which is drilled and countersunk for flat-headed wood screws.

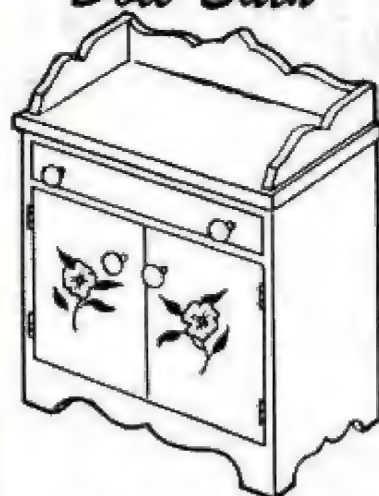
Three 1-in. cleats are fastened across the bottom of the box



Sled

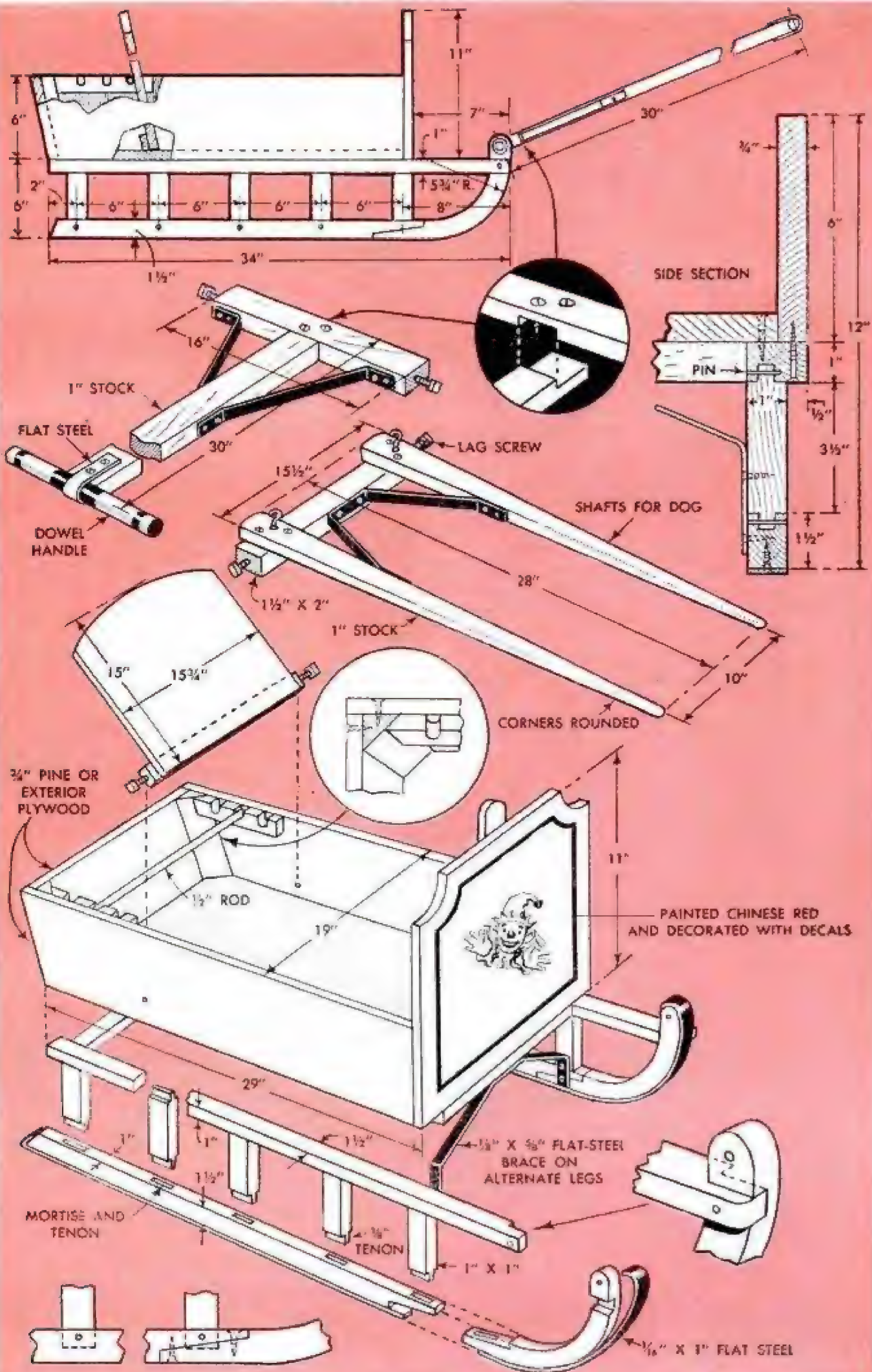


Doll Bath



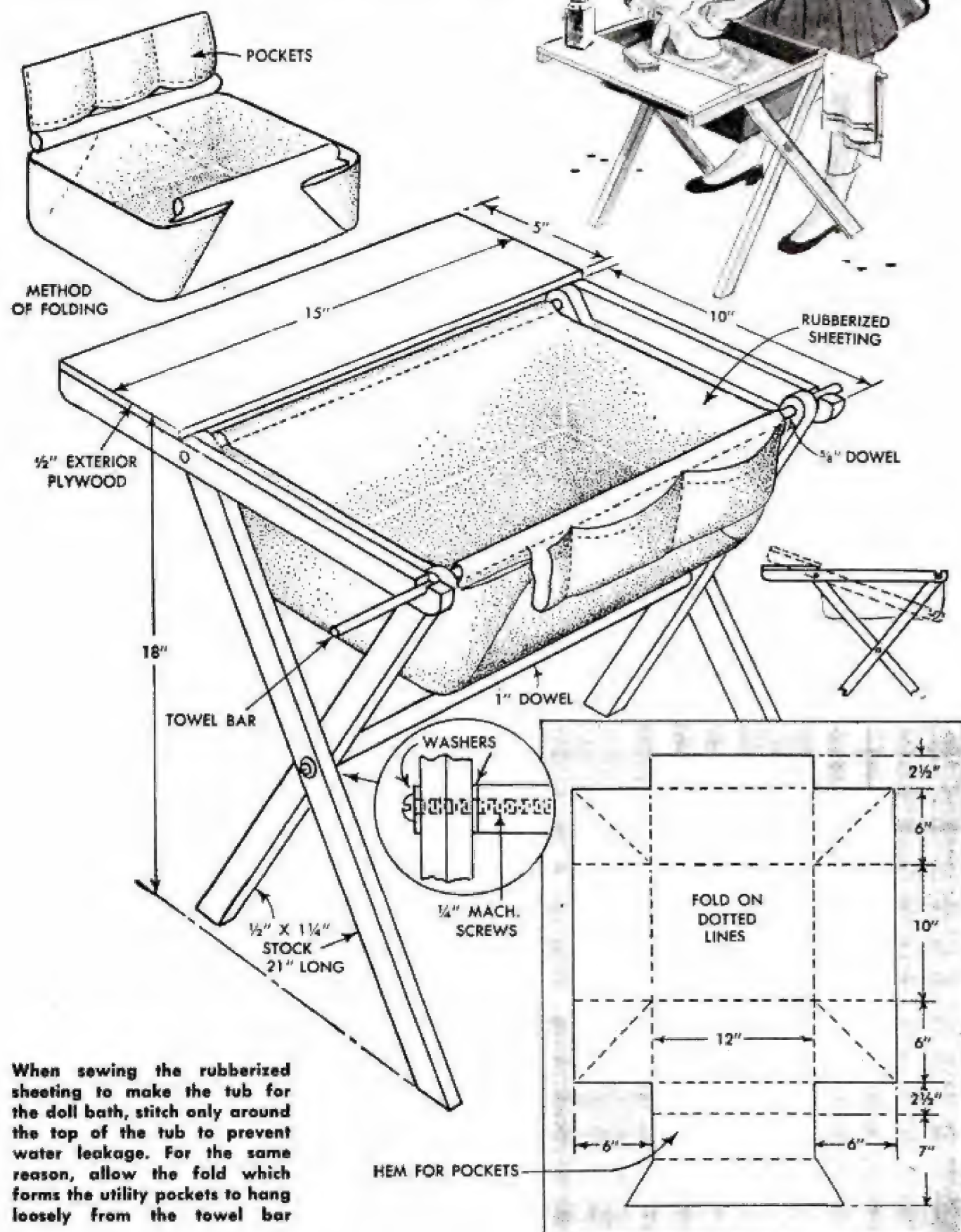
Sideboard



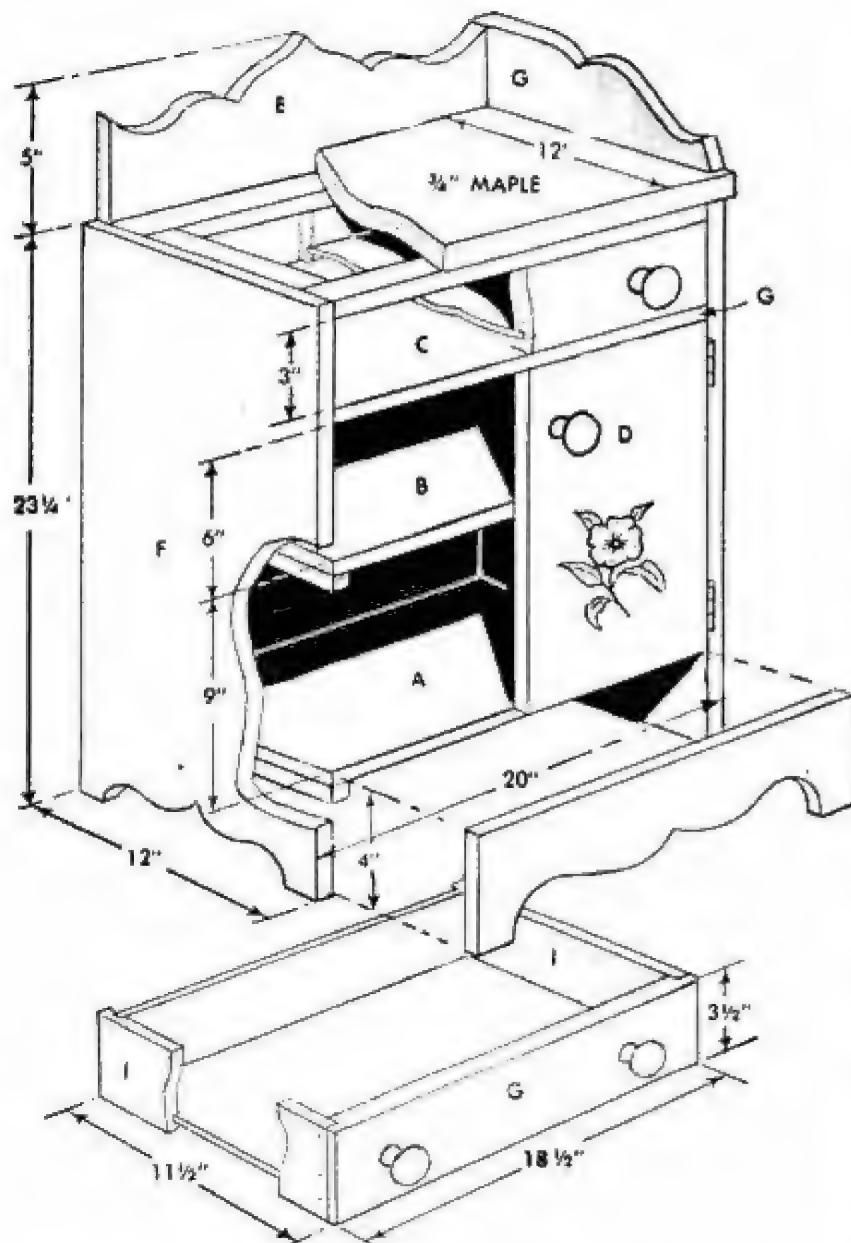


to align with the center and end rail separators. Then a flat-steel brace is screwed to each cleat and to the corresponding runner separators and lower rails. The finished sled can be equipped with a convenient handle or with shafts for harnessing a dog.

The neat little doll bath shown below is easy to make from $\frac{1}{2}$ -in. stock, plywood and rubberized sheeting. The X-frame legs are pivoted at the center to permit folding and the rear tray



When sewing the rubberized sheeting to make the tub for the doll bath, stitch only around the top of the tub to prevent water leakage. For the same reason, allow the fold which forms the utility pockets to hang loosely from the towel bar

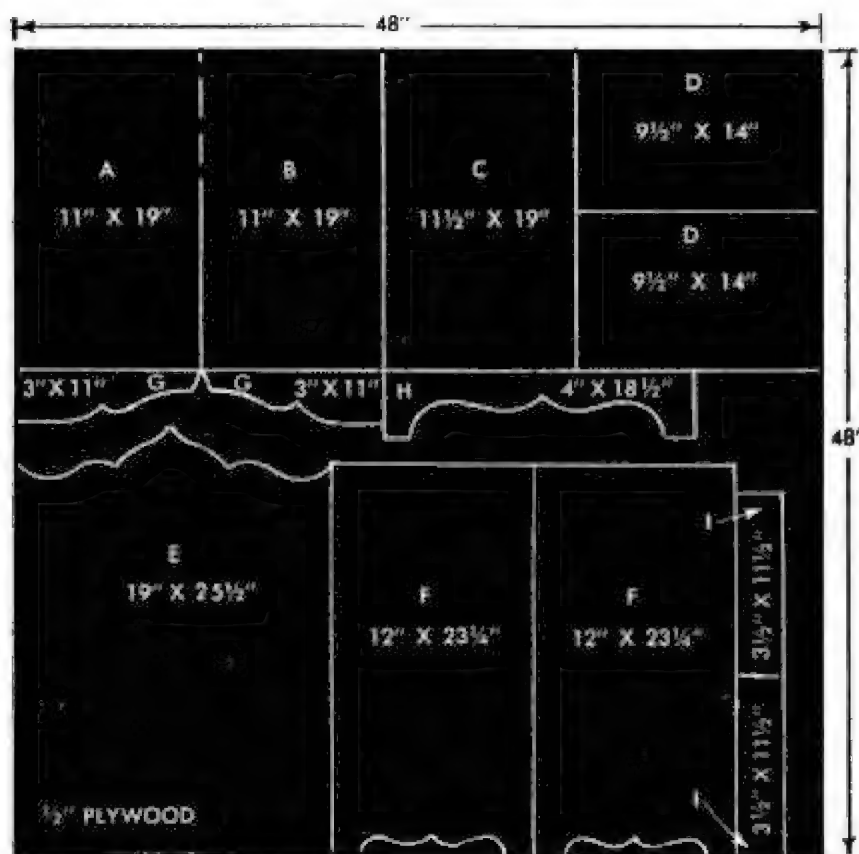


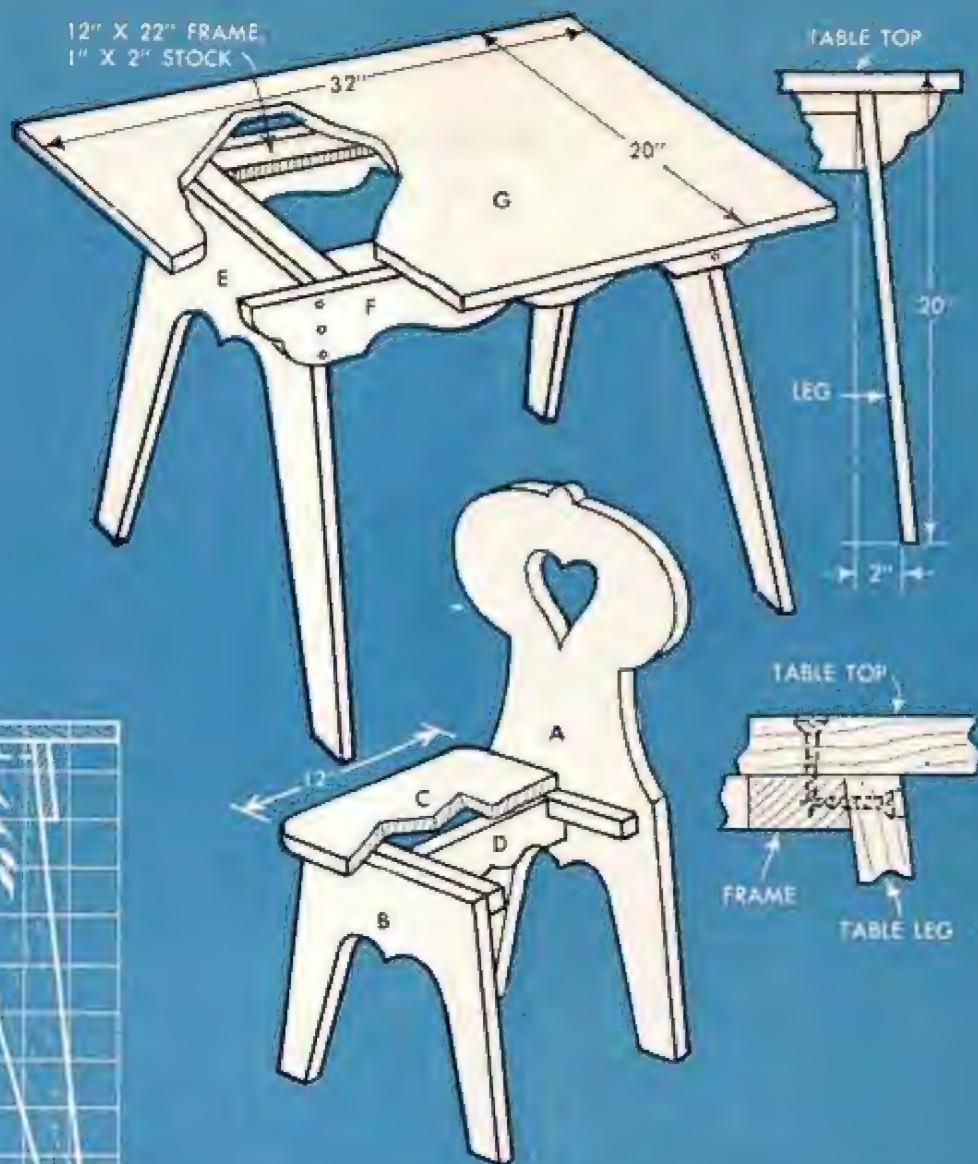
pivots on a length of dowel which extends through both leg frames. The front end of each tray arm is notched to engage the ends of the towel bar. After the tub pattern is cut from rubberized sheeting, all edges are taped. Then the sheeting is folded, as indicated by the dotted lines, stitched along the taped edges and hemmed to slip over the rear dowel and the towel bar. The wooden framework and shelf should be painted, preferably pink or blue, before assembly.

The sideboard and the table-and-chair set are made from 1/2-in. plywood as detailed on this and the opposite page. All plywood pieces for the sideboard can be cut from a 4-ft.-sq. sheet. The parts on the layout are keyed with the assembly drawing. A simple frame for the top of the sideboard, cleats for the shelves, wooden drawer pulls, hinges for the doors and a 1/4-in. plywood or hardboard drawer bottom complete the assembly.

Plywood pieces for the table-and-chair set are cut from a 4 x 6-ft. sheet of 1/2-in. plywood. After the table legs and side aprons have been jigsawed to the patterns shown, they are screwed and glued to a frame of 1 x 2-in. stock. The ends of the frame are beveled and the aprons mounted to splay the legs as in the upper right-hand detail. The 20 x 32-in. table top is fastened to the frame with countersunk screws driven from the top or with screws driven up from the underside of the frame. If the former method is used, the countersunk holes should be filled with wood putty before finishing the table.

Assembly of the chairs is done by adding cleats to the front-and-back pieces and then installing the cross braces, D. The seats are fastened to the cleats in the same way as the table top. Both the table-and-chair set and the sideboard can be finished natural, covered with wood-grain plastic veneer or enameled, with decorative decals added if desired. ★ ★ ★





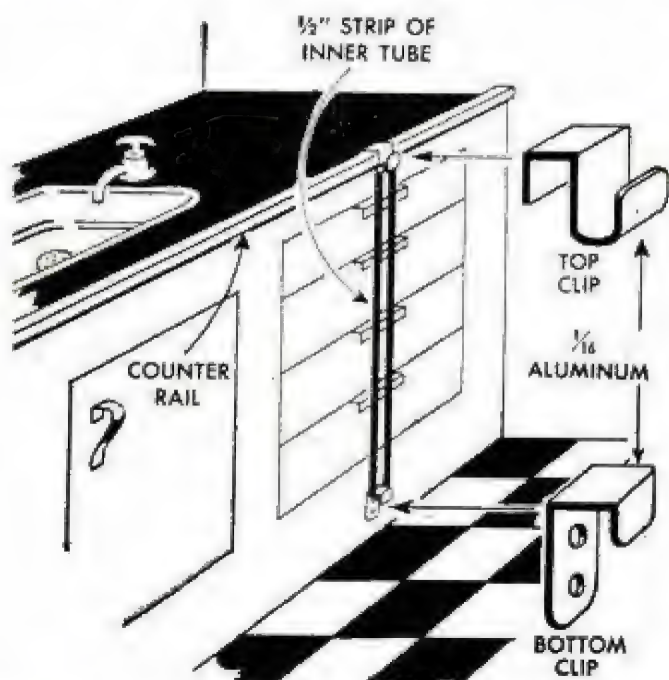
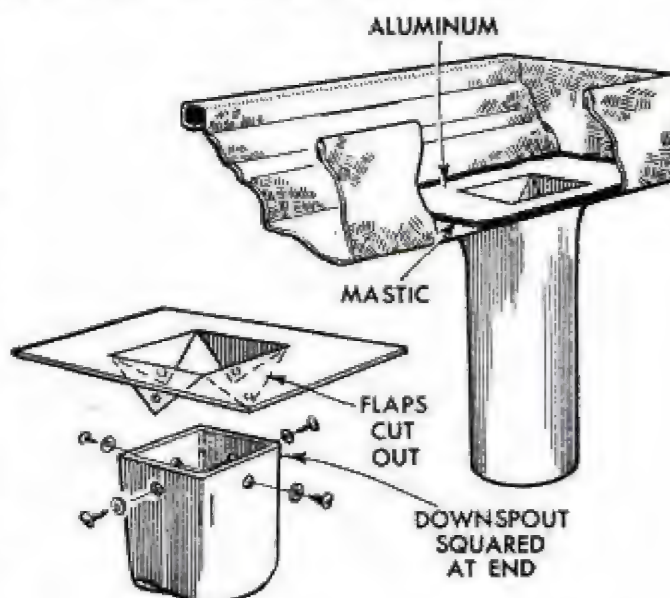
Handy Rolling Tool "Tree" Rotates for Selection



Especially useful to the auto mechanic in that it can be rolled from one repair job to the next, this novel tool tree keeps tools close at hand and rotates for quick selection. The pedestal supporting the tool holder is a 2 ft. length of 1-in. pipe which is fitted at one end with a floor flange for attaching it to a caster-fitted base. The upper end of the pipe is also fitted with a flange and screwed to a 12-in. plywood turntable. The holder itself is pivoted to the turntable with a single bolt after placing a large wooden washer between the two parts for free turning. One side of the pyramid-shaped holder is left open and is fitted with two or more shelves and the outer surfaces of the holder are fitted with hooks for hanging countless small hand tools. If you wish, the holder can be made to lift off the pipe standard.

Installing Aluminum Downspouts on Galvanized Eaves Trough

One homeowner, who decided to replace the rusted downspouts of his galvanized gutters with aluminum downspouts, discovered that contact with the galvanized eaves trough set up an electrolytic action which caused deterioration of the aluminum. To avoid this, he installed each of the downspouts as shown in the detail. Using a square, tapered wooden block, he squared the end of the downspout, and then made a hanger from heavy sheet aluminum. The hanger, which fitted into the bottom of the eaves trough, was cut so that four tabs were formed, and the downspout was screwed to these. A heavy coating of roofing cement was applied between the hanger and eaves trough to prevent contact.—J. Howard Cooper, Philadelphia, Pa.



Rubber Band "Locks" Drawers During Heavy Seas

To prevent the drawers in the galley of a small boat from sliding out in heavy weather, one boatman used a rubber band fastened between two aluminum clips, as shown. The upper clip was made to slip over the counter rail and the lower one was fastened to the cabinet with screws. He cut a strip of inner tube, $\frac{1}{2}$ in. wide, tied it into a loop, and used it over the clips in rough seas. The top clip and rubber band are stored in a corner of the top drawer, ready to be slipped on at a moment's notice.—George Brook Taylor, Daytona Beach, Fla.

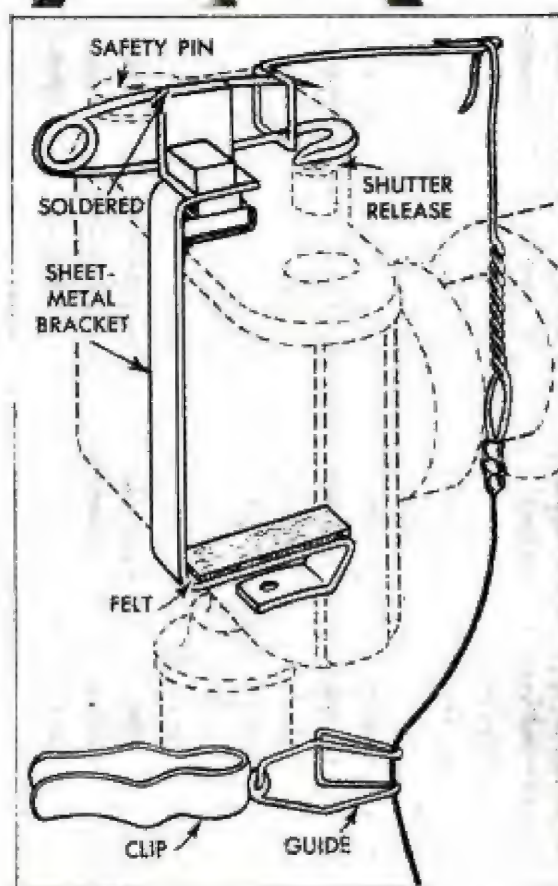
☞ To keep garden tools from rusting, drain the old crankcase oil from your car into a box of sand and stick tools into it.



SHUTTER RELEASE *takes nature close-ups*

By George T. Hillman

Designed for 35-mm. cameras having a plunger-type shutter release on the frame, this quickly improvised arrangement provides a reliable remote control for taking candid close-ups of live subjects, such as wild animals and birds. An ordinary safety pin supplies the necessary spring and striker. The clasp of the pin is bent at right angles as shown, and the pointed arm is soldered to a sheet-metal bracket which slips over the body of the camera. The bent clasp forms the striker. It is released by a "trigger" consisting of a wire ring and arm, the ring being slipped over both the clasp and the point of the safety pin when the release is "set." An eye at the end of the trigger arm takes a hook bent at one end of a length of wire. The opposite end of the wire is bent and twisted to form an eye for attachment of the trip cord, or thread. A pull on the thread from a place of concealment draws the trigger ring forward, releasing the safety-pin clasp which snaps downward, striking the plunger and releasing the shutter.



Two Lenses Used in Tandem for Close-Up Photographs

For extremely close-up photography, when a copy attachment is not available, a second camera lens can be placed in front of the regular one for excellent results. A short cardboard adapter in the form of a ring that fits over the barrel of the camera lens and the rear-element mount of the extra lens is used to couple the lenses. The two lenses are mounted as close together as possible without the glass touching. Focusing with this setup is best done on a

ground-glass. When the camera has no such direct-focusing facilities, set its focusing scale at infinity and place the object to be photographed so that the distance from it to the second lens is the same as the equivalent focal length of the auxiliary lens. Stop down the camera lens for the exposure, and increase exposure to three or four times the amount normally required. The result can be as good as if a copy attachment were used.



Enlarger Should Sit Level

In addition to resting firmly on a sturdy table, a photographic enlarger also should sit perfectly level. A slightly lopsided or tilted bellows, as well as a tendency of the enlarger head to stick when raised or lowered, are indications that the enlarger base is not level. Metal strips cut from film-pack containers are ideal for shimming the enlarger base to bring it level.—Robert Hertzberg, Jackson Heights, N. Y.

Dispenser Measures Solution



Small amounts of wetting agent can be added conveniently to a photographic solution if a hand-lotion dispenser is inserted in the bottle. The dispenser helps to avoid mixing too strong a solution, by squirting out just the right amount for small quantities,

and eliminating the difficulty of measuring the agent from large bottles. The dispenser is available wherever cosmetics are sold.

Your Versatile Shaper

There's more to be had from a shaper than merely running an edge on a table top. In fact, one of its main uses is molding and coping panel doors. Get the most from your shaper by reading, "How to Make Panel Doors" in the December issue. Profusely illustrated, this picture story shows you how to turn out millwork of professional quality

Sponge Used to Wipe Film Stored in Glass Jar

A viscous (cellulose-type) sponge is excellent for wiping excess moisture from photo films before they are hung up to dry, but it is important that the sponge be kept free of grit. One way of keeping the sponge clean is to store it in a wide-mouthed glass jar. The type in which peanut butter and other foods are packed is ideal for this purpose.

Virginia Hanson, Venice, Calif.



Stirring Rod for Darkroom Use

Obtainable at most ten-cent stores, a glass rod of the type used on inexpensive towel racks will provide an ideal noncontaminating rod for mixing and crunching photo chemicals in gallon bottles. When the rod is not in use, a holder can be provided for it by mounting one of the towel-rack brackets on the darkroom wall.

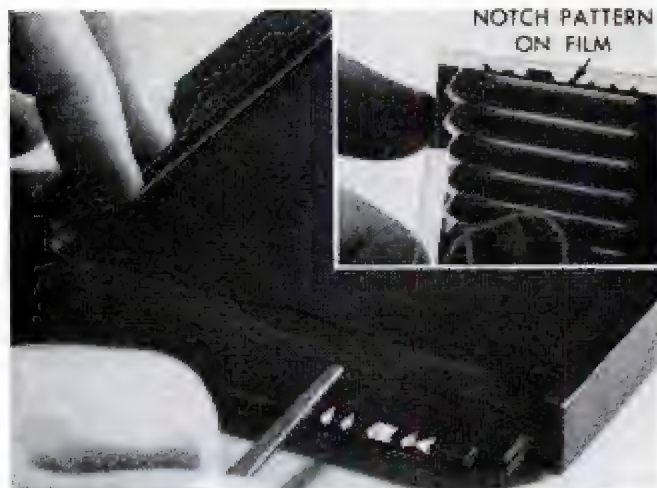
Andy Holmberg, Elsinore, Calif.

Paint Swatches Aid Exposure

In color photography, it is often desirable to accent one color more than the others, as for example, when photographing a cloth in which there are several colors. The exposure meter held against the cloth will not give a true reading. But if a packet of paint swatches, such as are supplied by many paint manufacturers and contain several hundred colors and shades, is at hand, the job is an easy one. Hold a paint swatch that closely matches the color to be accented under the same light in which the picture will be taken, and take an exposure meter reading up close. The setting indicated will bring out the best reproduction of the desired color.



Negatives Numbered at the Time of Exposure



Above, notch patterns filed in edge of holder flap expose film, reproducing pattern as in the inset. Below, numbered holders aid in recording data



This numbering system enables the photographer to set up any convenient negative file with each number symbol registered on the negative at the time of exposure. The number symbols can be keyed in such a way as to record exposure data, place, time, season or any other desired information. To record the numbers of the film, notches are filed in the opened film-holder flap as in the upper left-hand photo. Although the notches can be in any convenient pattern or shape, the pattern pictured works out very well with a recorded system of values attached. As an example, a single V-notch can indicate 1, a square notch 5, and two V-notches with the Vees filed to a point might be given a value of 20. By using these, or similar combinations,



all holders and negatives can be numbered. The number symbols on the negative are outside the picture area as in the inset in the upper left-hand photo.

As an added convenience, the holders may also be numbered on the outside with small decal numerals as in the lower left-hand photo, the numbers corresponding with those represented by the notches in the flap. After applying to the frame of the holder, the decal numerals are shellacked.

To record data at the time the exposure is made for copying later into a record file, adhesive tabs applied to the holders as in the right-hand photo provide a quick means of jotting down a record which can be correlated later for a permanent reference.

Donald W. Honick, Chicago.

Brushes for Cleaning Negatives Should Be Cleaned Often

Because a camel-hair brush used for cleaning negatives soon becomes contaminated and eventually deposits more than it picks up, it should be washed regularly with a soap shampoo. A coconut-oil or emulsifier-type of shampoo is best for this job, because it leaves a slight film of oil on

the camel hair, preserving its softness and preventing it from drying out. Detergents and dry-cleaning fluids should not be used, since they dissolve the natural oils of camel hair. Cleaning fluids also have a tendency to destroy the rubber base that anchors the bristles of the brush.



Sponge and Electric Mixer Used as Film Agitator

When developing film, one photographer provides himself with an economical agitator for a film developing tank by using a small sponge and an electric food mixer as indicated. The tank is set upon the sponge so it will tilt easily in any direction, and then moved within reach of each of the mixing blades. With the mixer operating at slow speed, this arrangement allows the rotating blades to hit against the tank lightly, thus creating the desired rocking movement.—J. M. Bridger, Bladenboro, N. C.

Drip Catcher for Chemical Bottle

A hollow rubber ball can be adapted easily for the purpose of helping to prevent photographic chemicals and other corrosive liquids from dripping down the side of the bottle while being poured. After cutting the ball in half, cut a small hole in one of the halves that will permit it to be forced over the neck of the bottle to form a collar. When finished, simply replace the bottle cap and rinse out the collar by holding it beneath a water faucet.

Protect Filters From Lint

By replacing the cellulose - fiber padding found in filter cases with pads cut from sheet foam rubber, photographers will find that their filters are free from lint when removed from the case. Using rubber cement, one pad should be cemented in place in the bottom of the case and another in the top to adequately protect the filter.



Robert C. Florian, Cicero, Ill.

Popular Mechanics Bookshop



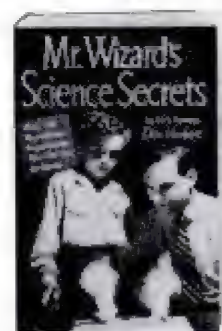
Gadgets Galore

DORSEY CONNORS, famous television star, tells you how to make hundreds of useful household items from materials you ordinarily would throw in a wastebasket. With wire coat hangers, old shirts, thumbtacks and scraps of wood she fashions countless ornamental and useful objects. Here's a book that will keep the woman of the house fascinated for hours on end, and one that would make a fine gift for anybody. Price is just \$2.95



Album of Aviation

REMEMBER the balloon rides at the county fair? The old-time daredevils that provided chills and thrills at the early air shows? The headlines when Lindbergh landed in France? You'll find them all in the *Album of Aviation*. Between the covers of this book are hundreds of pictures, a sparkling text, and a good deal of nostalgia. It's an entertaining history of man's humorous, foolhardy and brave efforts to fly. Price, \$3.00



Mr. Wizard

THIS SPACE is reserved for junior wizards: Sometimes older folks have trouble answering questions, especially those involving science. Mr. Wizard, the TV star, can answer most any such questions, which he does in this book. Actually, he helps you find the answers yourself in 150 exciting experiments. He tells you how to boil water with ice, how to make a telegraph set, and demonstrates the magic of electromagnetism. Price, \$3.00

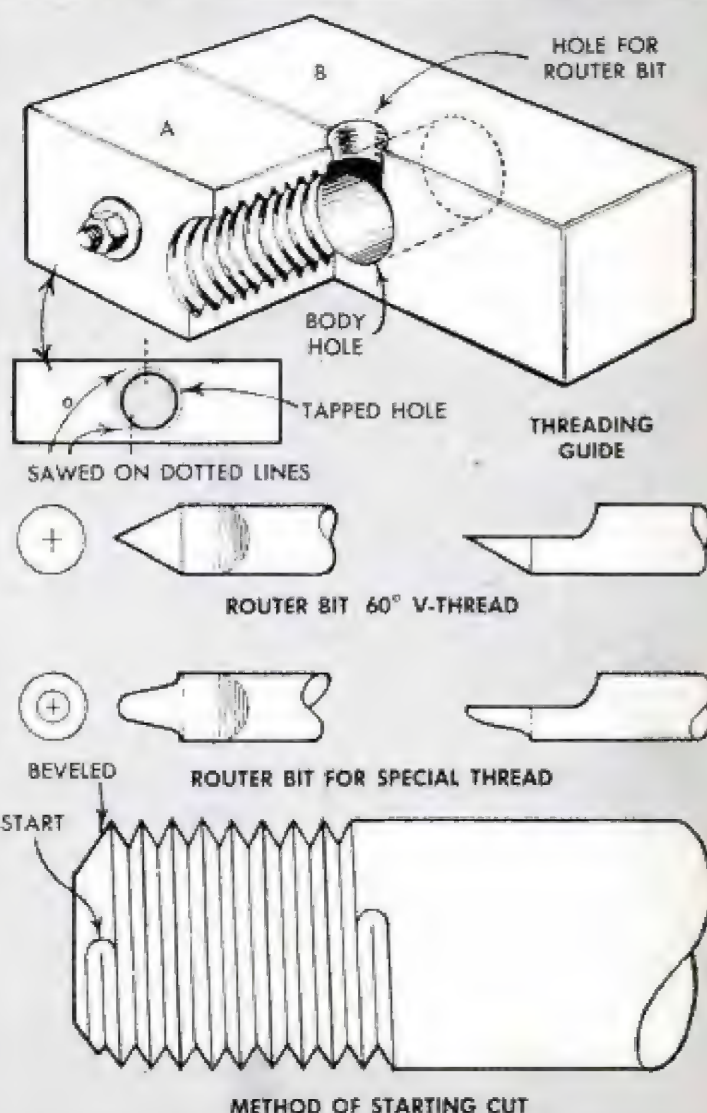
All books available from Popular Mechanics Book Department, 208 E. Ontario St., Chicago 11

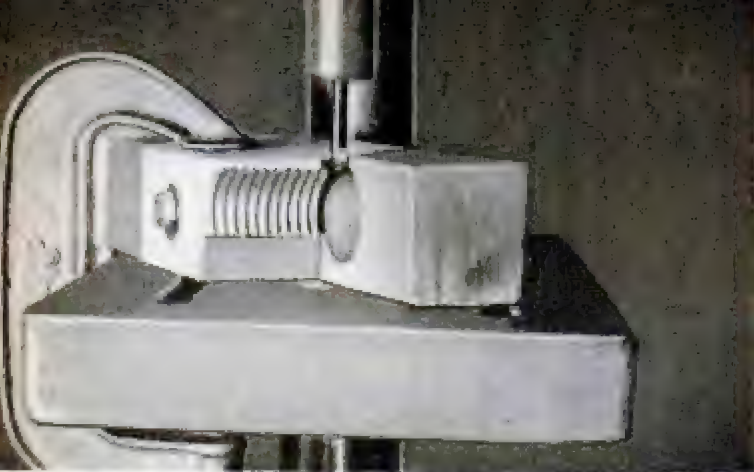
MAKE WOODEN THREADS

on your Drill Press

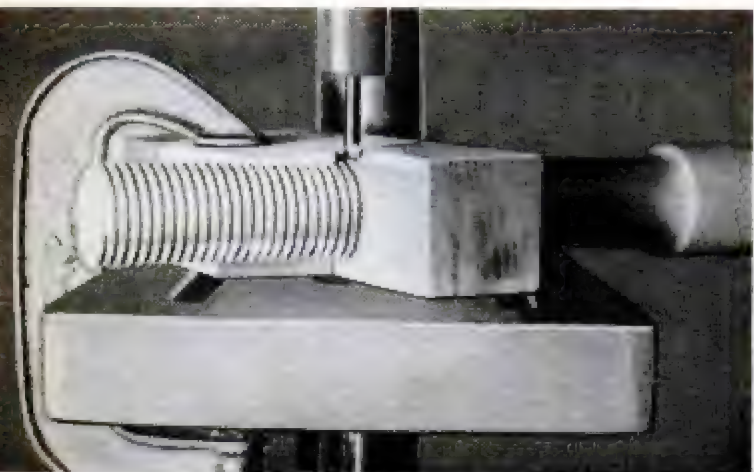
By T. L. Stalker

CLEAN, SHARP THREADS can be cut in hardwoods by utilizing the high speed of the drill press and the free-cutting properties of special router bits. Hardwood screws for clamps, or hand screws, handles and hand presses of various kinds are easily made in less time than it would take to thread metal rods for the same applications. A simple two-piece jig or guide clamped to the drill-press table gives the thread the correct pitch. This consists of the parts A and B in the detail at the right. Part B is bored as indicated, the size of the body hole being slightly larger than the diameter of the turned portion of the work on which the threads are to be cut. Part A is bored with a tap hole, the diameter of the hole being slightly greater than the root diameter of the thread. The hole is then tapped, using a special tap for wood threads of the type pictured in the upper right-hand photo on the following page. These special taps are easily made on a metal-turning lathe or can be purchased ready-made in limited-size variations. After tapping, part A is sawed on the dotted lines and the remaining portion of the block is then bolted to part B, with the bottom of the thread lining up with the side of the body hole. This assembly forms the combination guide and lead screw which is clamped to the drill-press table as in the photo above. Locate the guide on the drill-press table so that it centers under the chuck at a point about $\frac{1}{8}$ in. from the edge of part B, and directly over the center of the body hole. Then insert a $\frac{3}{8}$ -in. bit in the chuck and drill the clearance hole for the router bit.

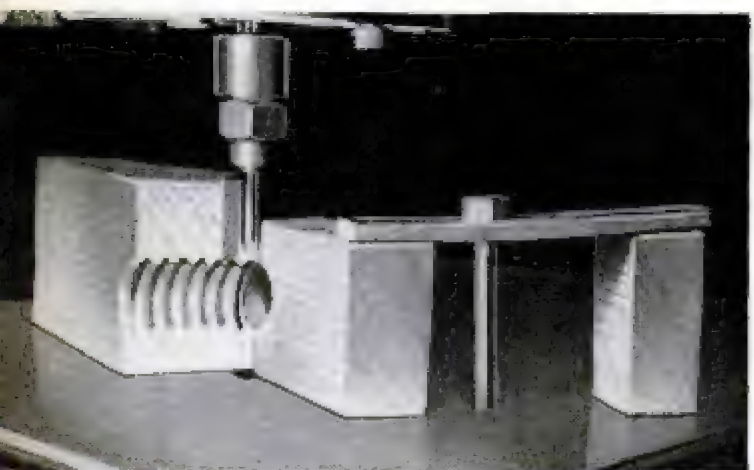




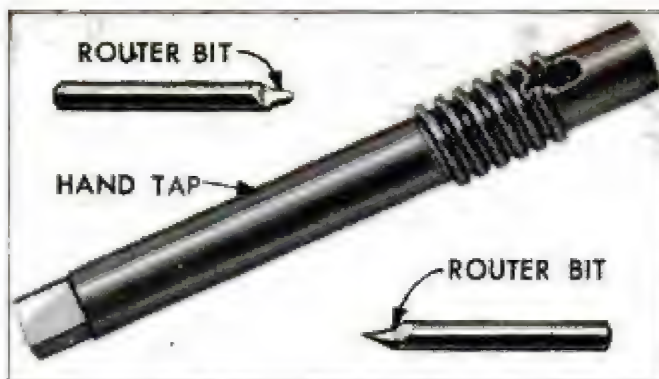
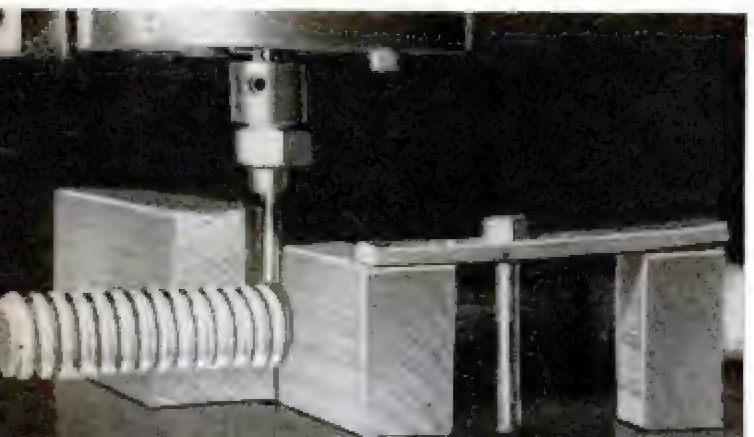
Jig, or guide, is clamped to drill-press table with router bit lowered to position in clearance hole



A 60-deg. thread partially cut. Lead screw on tapped section of jig gives newly cut thread correct pitch



Photos above and below show jig set up on over-arm router for cutting a round-bottom thread. Here a table clamp rather than a C-clamp is used to hold jig in position. Note coarser pitch of thread



Suitable router bits can be made from $\frac{1}{4}$ -in. drill rod by grinding a flat to the center line and then grinding a 60-deg. point on the end to form a sharp V-thread, or a rounded point to form a round-bottom special thread as in the center details on the preceding page. The two upper photos at the left show a 60-deg. thread being cut, while the lower photos show a round-bottom thread partially cut. The 60-deg. thread usually is preferred in hardwoods such as maple and beech.

The portion of the work on which the threads are to be cut should be turned to a diameter about $\frac{1}{32}$ in. less than that of the body hole in the guide. This allowance permits the work to turn freely yet holds it sufficiently true to the axial line to assure threads of a uniform depth. Note in the lower detail on the preceding page, that the end of the blank to be threaded is beveled. This bevel takes the form of a spiral having approximately the same lead as the thread to be cut. Wrap a strip of paper around the end of the blank and then shift it until the edge forms the required spiral. Hold in place with tape and file the bevel to the edge of the paper.

Now insert the router bit in the chuck and lower it to cut to the correct depth, as in the upper left-hand photo. Arrange the belt on the V-pulleys to give the highest spindle speed. Then insert the blank in the body hole in the guide and bring it up until the bit touches the side of the beveled end. Start the drill press, steady the work with both hands and turn it slowly to the right. As soon as the newly cut thread engages the lead screw it will advance automatically the correct amount for each turn. Any slight irregularity in starting the thread can be corrected easily with a three-cornered file after the work is removed from the guide. In some woods the threads cannot be cut successfully to a sharp crest without some chipping. In this case, set the router bit a trifle higher so a narrow flat is left at the crests. If the thread cut in this way fits too tightly in the tapped hole, it can be cut deeper with a file. Softer woods often thread best when the blank is soaked overnight in linseed oil. ★ ★ ★

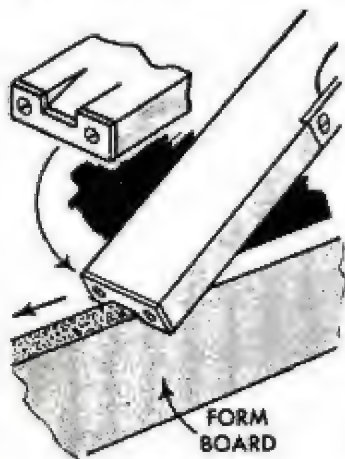
Shield Protects Bottom of Pail



To guard against denting or puncturing the bottoms of feed and milk pails, especially the latter, one farmer makes an effective shield by cutting off the lower half of a discarded pail and fitting this over the bottom of the good

one as shown in the illustration. The cut edge of the shield is crimped lightly so that it will grip the sides of the pail and stay in position. The shield is easily removed when cleaning the pail.

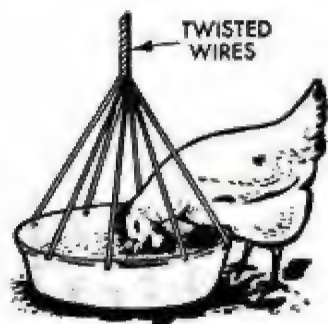
Level Scrapes Cement Forms



Form boards used in sidewalk construction and later re-used for other work are often so coated with dried cement that it is difficult to use a level on them. To scrape the edges of these boards quickly, one contractor filed a deep notch in the metal end

plate of his level. This permits rapid cleaning of the boards without using an extra tool and does not affect the usability of the level for its original purpose.

Guard on Poultry Feeder Formed From Stiff Wire



Improvised from an old dishpan or wash basin, this inexpensive poultry feeder is provided with a wire guard to keep chickens from climbing into the pan and upsetting it. First, holes are

punched around the edge of the pan 3 or 4 in. apart to take the ends of short lengths of stiff wire, which then are twisted and secured around the rim. The upper end of the wires are joined by twisting to form the guard. The top of this guard can be a handle for lifting the feeder.

Albert P. Zanelli, Tampa, Fla.



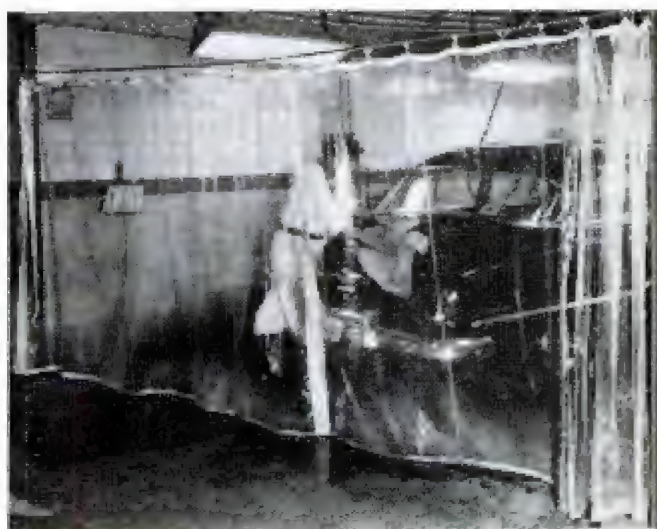
Stand Supports Wheel Wrench To Speed Truck-Tire Change

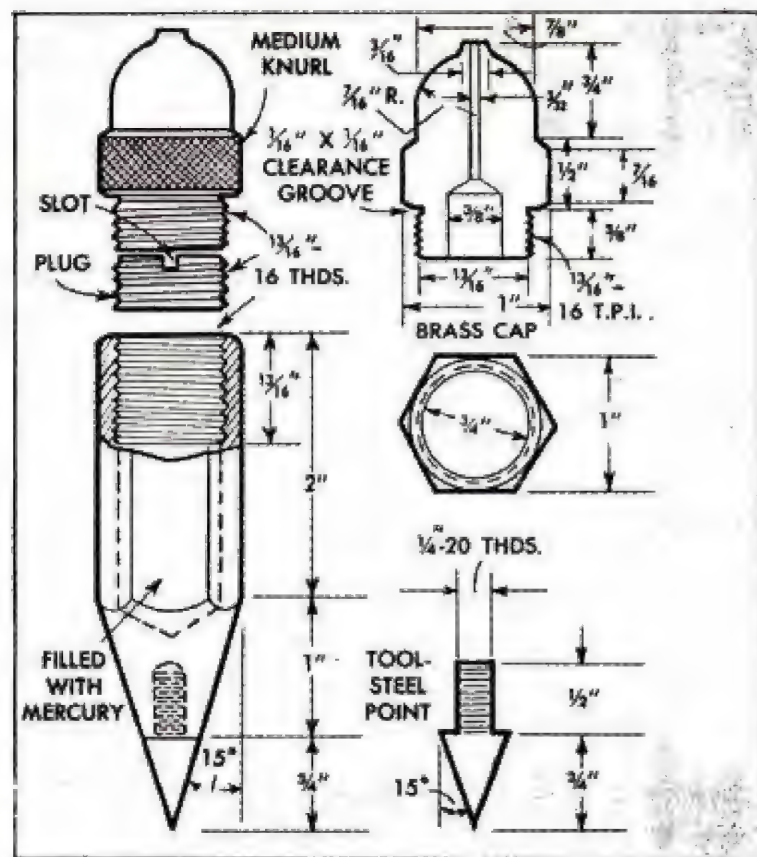
Supporting one end of a wheel wrench as shown, this sturdy stand enables a farmer to apply extra leverage when loosening and tightening nuts or cap screws on a truck wheel with less chance of the wrench slipping off. The stand is assembled from lengths of pipe and scrap steel welded together, along with cleats welded to one leg that permit supporting the wrench at whatever height may be required.

Grover Brinkman, Okawville, Ill.

Curtain Keeps Splashing Water Inside Car-Wash Stall

In one garage, a clear-plastic shower curtain installed across the opening to the car-wash stall not only keeps the splashing water confined to the stall but also permits the customer to watch without getting wet. This arrangement is especially useful in a garage or service station having a small stall located in the midst of other activities.





MERCURY PLUMB BOB

By C. W. Woodson

FOR PRECISE WORK, such as setting up a transit, a plumb bob must be of the correct proportions and weight so that it steadies quickly and remains in position. A mercury bob, being considerably heavier than the normal solid type of equivalent size, has less tendency to swing in a breeze and thus takes less time to come to rest.

The body of the bob is turned from 1-in. hexagon brass rod. When chucking the work for the first operation sequence, be sure that it runs dead true. Turn the taper on the end, face-off and then drill and tap $\frac{1}{4}$ -20 for the tool-steel point. Reverse the work and recenter it as before. Bore to a depth of 2 in. with a tap drill for a $\frac{13}{16}$ -16 thread. Run the thread into the bore to a depth of $\frac{13}{16}$ in., then face-off the end.

Next, the tool-steel point is machined to the same taper as the body of the bob. Then it is threaded, hardened and the temper drawn to a purple color. Both the plug and the end cap must be machined from stock long enough to be held securely in the chuck. Turn and thread the plug and slot the end before cutting off in the lathe. Note that the end cap is turned to the acorn shape, counterbored for the cord and that the flange is knurled. Run a squaring cut on the lower end of the flange so that it

seats tightly on the top of the body. Then cut a $\frac{1}{16}$ x $\frac{1}{16}$ -in. clearance groove and run the threads back on the shouldered projection to the groove.

Fill the body of the bob with mercury and turn in the plug slowly to allow any entrapped air to escape. Then tie a knot in the end of the cord, pass the cord through the counterbore and screw the cap in place finger-tight. *Caution:* Use extreme care in handling mercury. Dispose of all unused portions safely.

Broken Electric-Light Bulb Removed With Corncob

To remove a broken bulb from an electric-light socket without the risk of cutting himself, one farmer inserted the end of a corncob in the bulb for loosening it. When pressed tightly against the socket and remaining fragments of the bulb itself, the corncob in most cases will grip the bulb sufficiently for unscrewing it. Care should be taken, however, to make sure the current is off and, as an added precaution, that the corncob used is neither wet nor damp. A large bottle cork also may be used for this purpose.

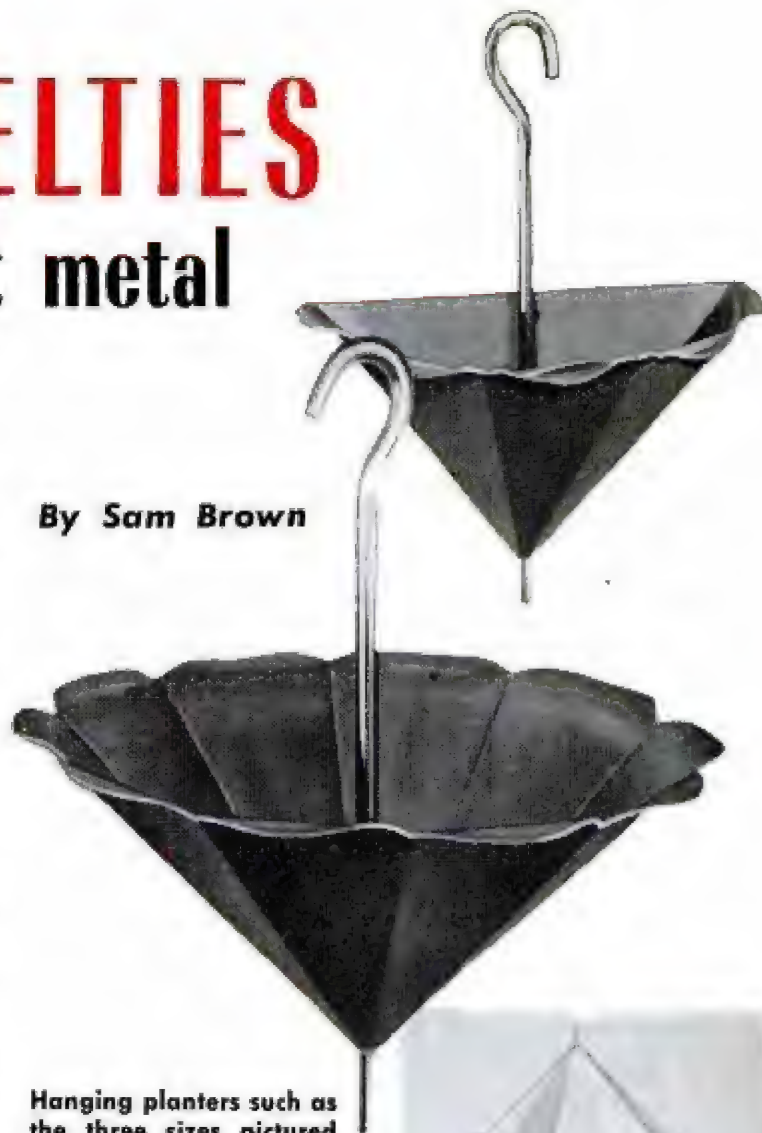
G. E. Hendrickson, Argyle, Wis.



NOVELTIES in bent metal

By Sam Brown

SIMPLE PROJECTS in bent sheet-metal have a certain decorative individuality not matched by other hand-crafted pieces. Bends in the attractive projects pictured are made quickly with a small bending brake, but they can be just as easily formed by hammering over hardwood blocks. Very little curved work is involved and the stretchouts are easily developed as in the cross-hatched patterns detailed on the following two pages. Use 20-ga. materials for the projects, as this thickness in either copper or aluminum works readily, takes sharp bends and holds its shape after forming. Such projects as the ash tray, coal-hod planter and the flower-pot holder are typical one-evening jobs, but the umbrella planters and the lamp will require a little more time. The toolholder is a job for the bending brake. Use 22-ga. metal and hem the edges before making the reverse bends. The hanging umbrella planters can be made either half or full umbrella shape and with plain or scalloped edges. For artificial flowers the assembly is made with sheet-metal screws or rivets. For growing plants the joints must be made watertight by soldering. The lamp shade is made from the umbrella pattern, but the base is developed as in the lower left-hand detail on page 207. Be careful to cut the inner radius accurately, as the metal must fit tightly around the lamp socket. Both the lamp shade and the full-umbrella planter have a turned brass insert at the tip of the cone. In the planter this is drilled for the hanger hook, but the shade is tapped from both sides for top ornament and bulb clip. To make the joint watertight fill the openings with solder or waterproof cement, such as household cement. ★ ★ ★



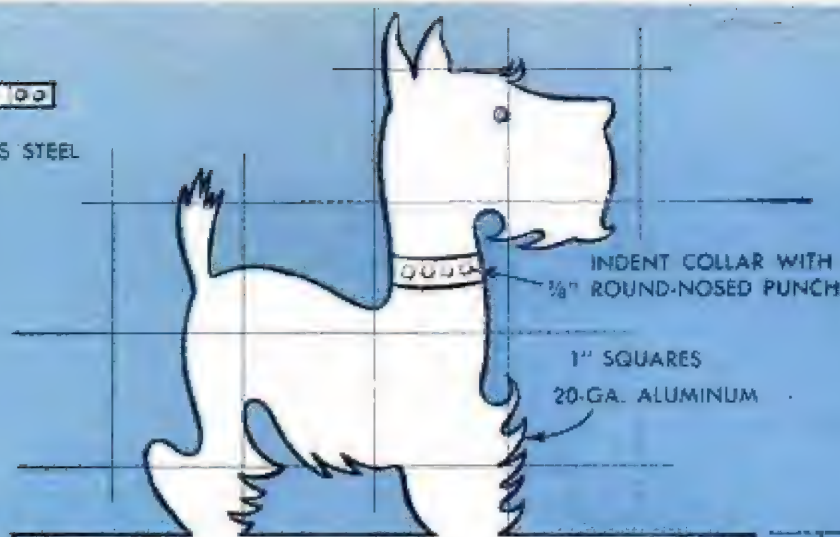
Hanging planters such as the three sizes pictured above, can be made either half or full umbrella shape, with scalloped or plain edges. Lamp shade at right is same as full umbrella



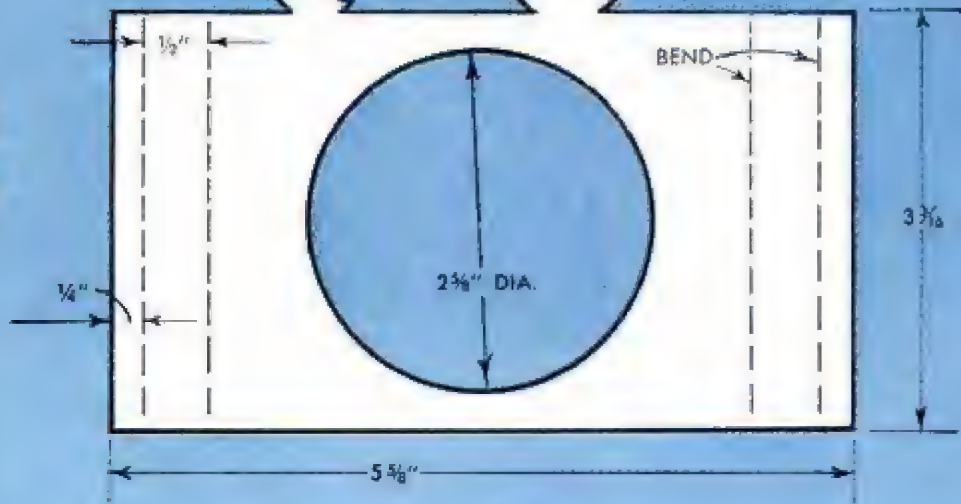
Ash tray, coal-hod planter and pot holder are especially attractive when made of copper and highly polished. Ash tray itself is separate and can be hammered, spun or purchased in size required. Scotty pattern is part of holder and cut on jigsaw



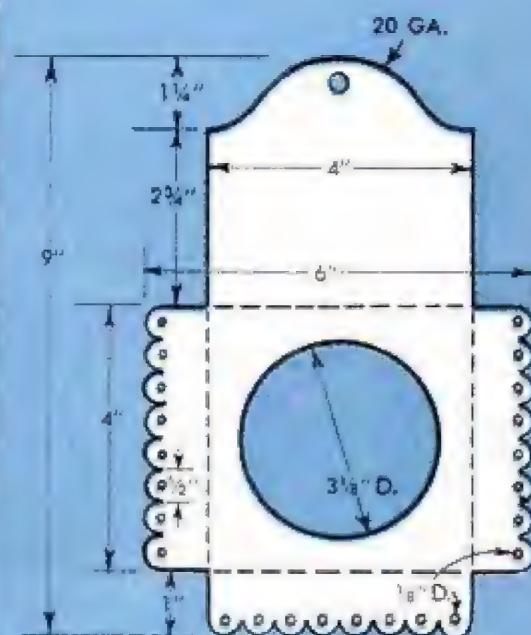
COLLAR
34-GA. STAINLESS STEEL



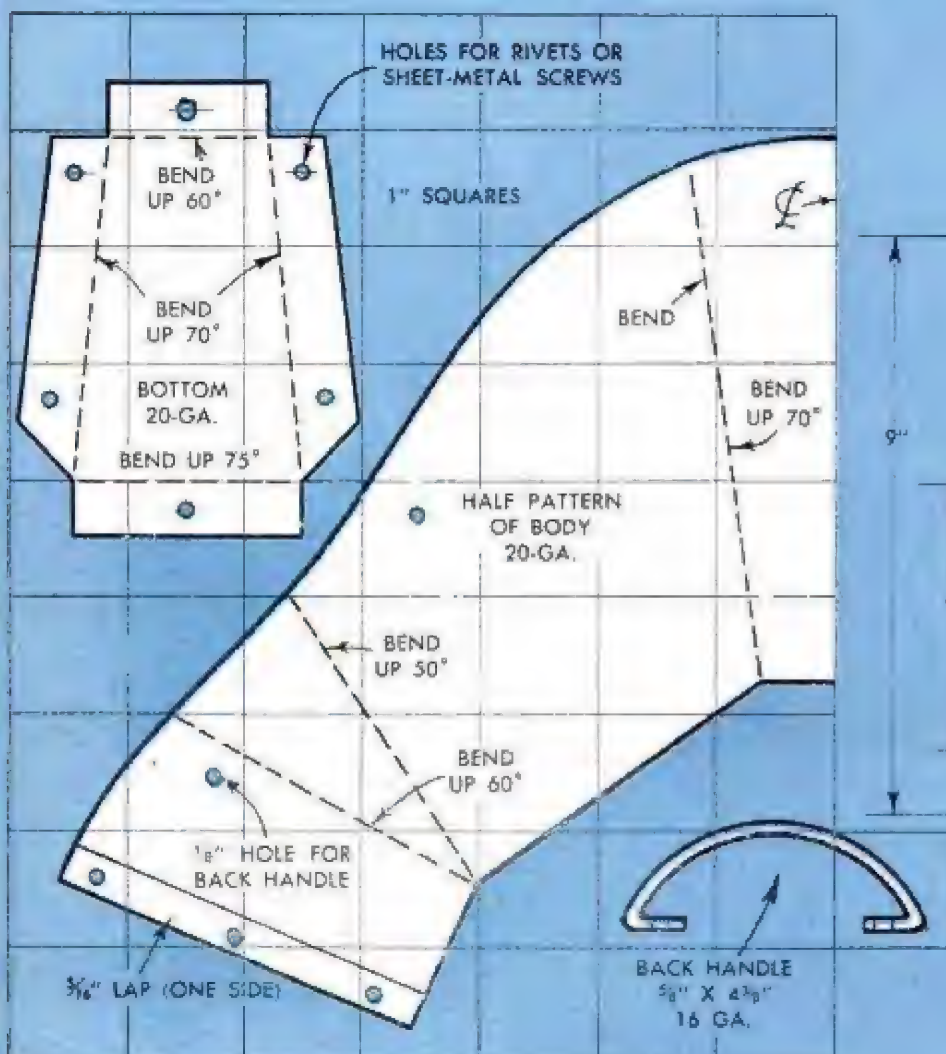
*Ash
Tray*



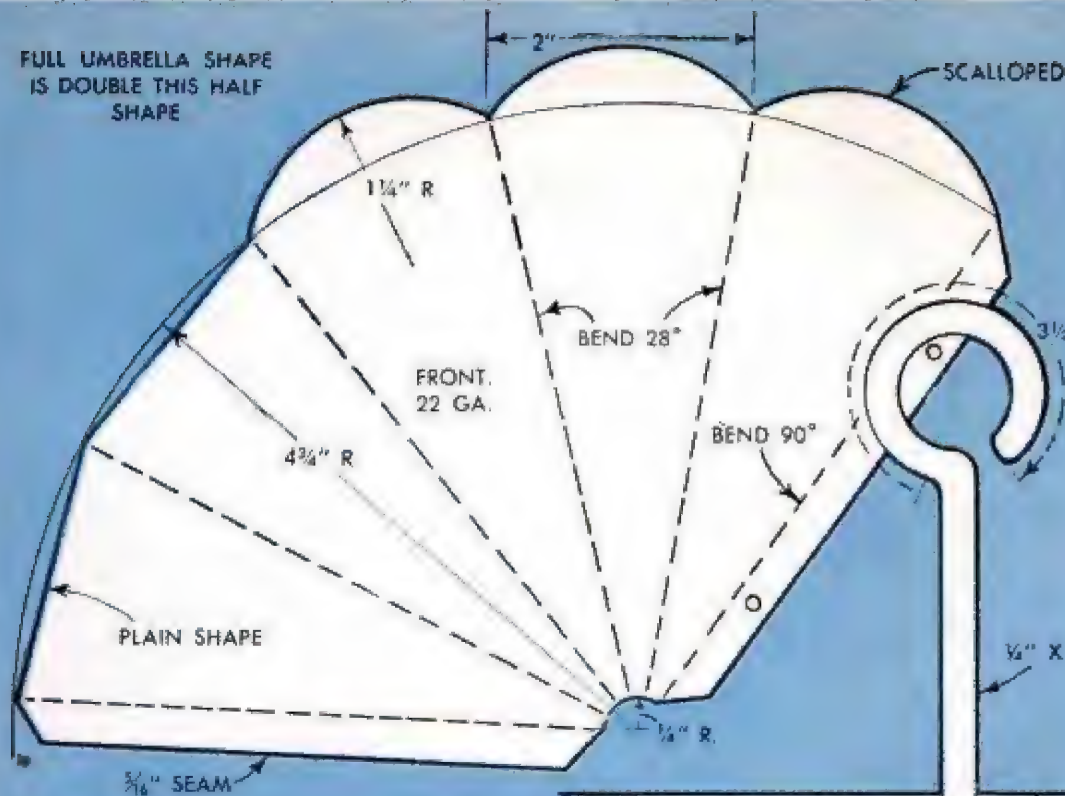
*Flower Pot
Holder*



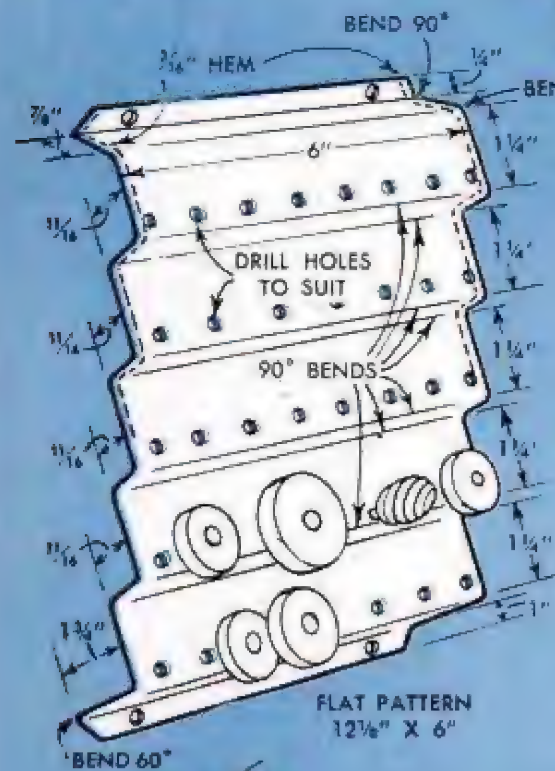
*Coal-Hod
Planter*



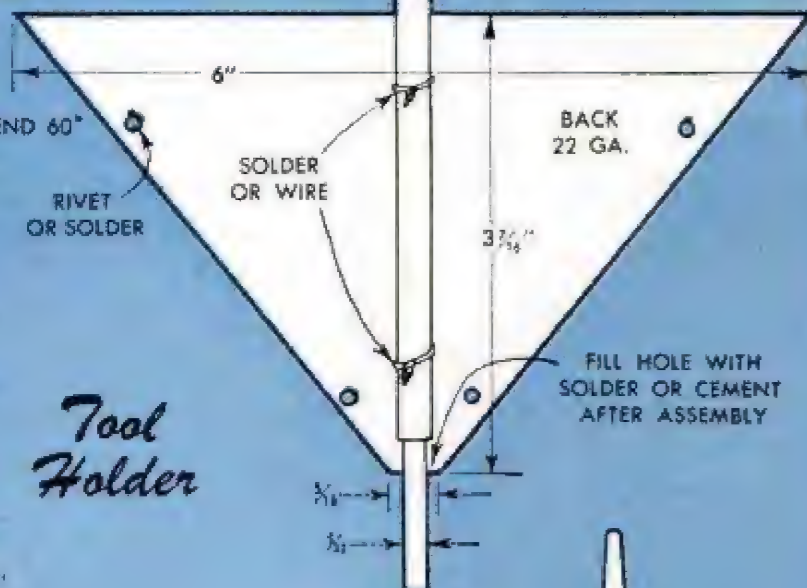
FULL UMBRELLA SHAPE
IS DOUBLE THIS HALF
SHAPE



Umbrella Planter

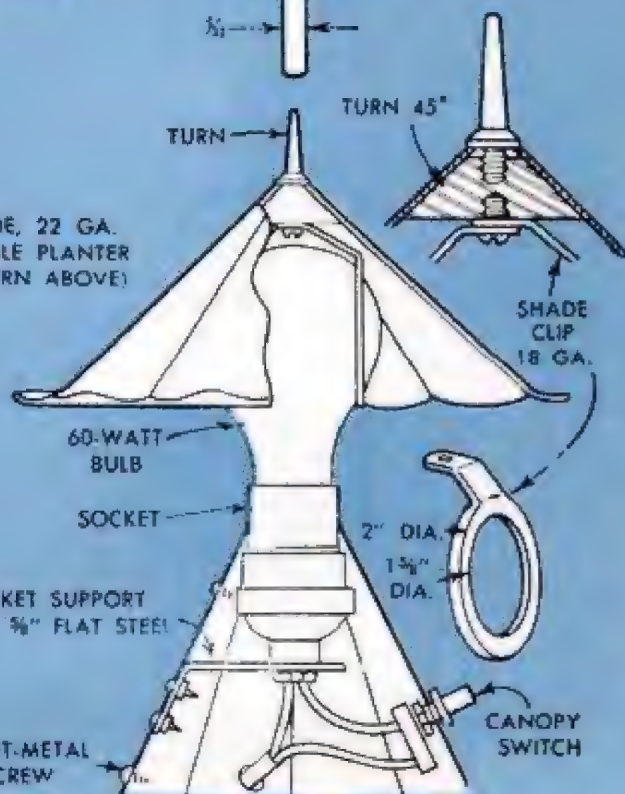
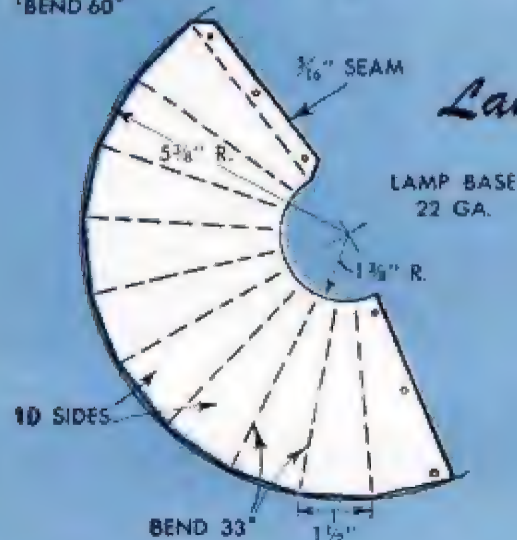


Tool Holder



SHADE, 22 GA.
(DOUBLE PLANTER
PATTERN ABOVE)

Lamp



Beveled File is Cutting Blade On Bench Utility Shear



Made from a large file and a short length of heavy steel angle, this bench shear will perform many cutting jobs around the shop or farm. One web of the angle is flame-cut to a semicircular shape with slots of various sizes cut in one half of the curved edge. Holes of different diameters are drilled in the other half in which bolts, heavy wire, etc., may be held for cutting. The other web of the angle is clamped in a bench vise. The file is ground to a bevel along one edge and either riveted or bolted to pivot on the horizontal web as shown. The bevel should be no more than 5 deg.—10 deg. at most—to lessen the possibility of the edge chipping off under too much strain. A handle completes the unit.

Altered Corn-Planter Plates Give Varying Hill Drop

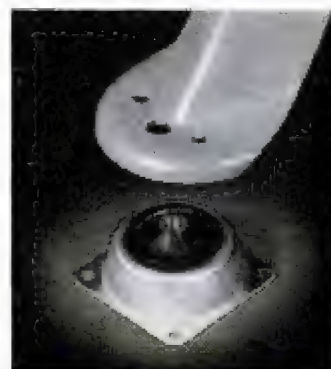


On average land farmers can increase corn yields in good years by altering planters to alternately drop three and four kernels per hill. To accomplish this change in the rate of drop, opposite openings on planter plates of the edge-drop type are closed by running metal from a bronze welding rod into each

opening as indicated by the arrows. The weld metal is then ground down to the exact contour of the plate. As will be seen from the photo, this procedure reduces the openings in the plate from 16 to 14, or 4 and 3 on each side of the plate. When these altered plates are used the planter will drop alternately three and four kernels per hill.

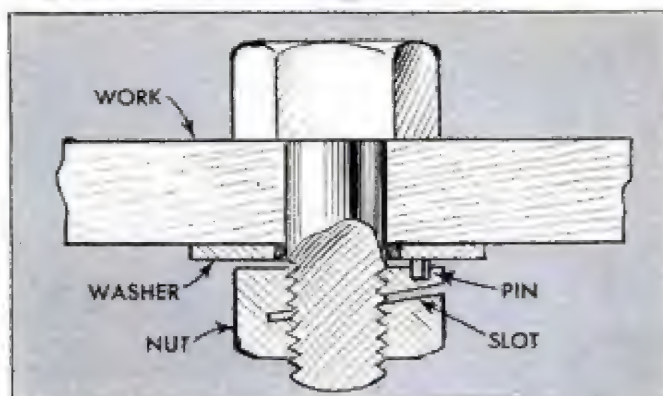
Surplus Vibration Dampeners Used as Machine Mounts

Excellent sound and shock-absorbing pads for light machinery can be improvised from shear-type vibration dampeners. First designed for use as instrument mountings in planes and tanks, the rubber-cushioned dampeners are well suited to any number of uses where vibration is a problem. Available as war surplus, the dampeners are ready-drilled for attaching to both machine and surface.



Any number of uses where vibration is a problem. Available as war surplus, the dampeners are ready-drilled for attaching to both machine and surface.

Slotted Nut Having Offset Pin "Locks" When Tightened

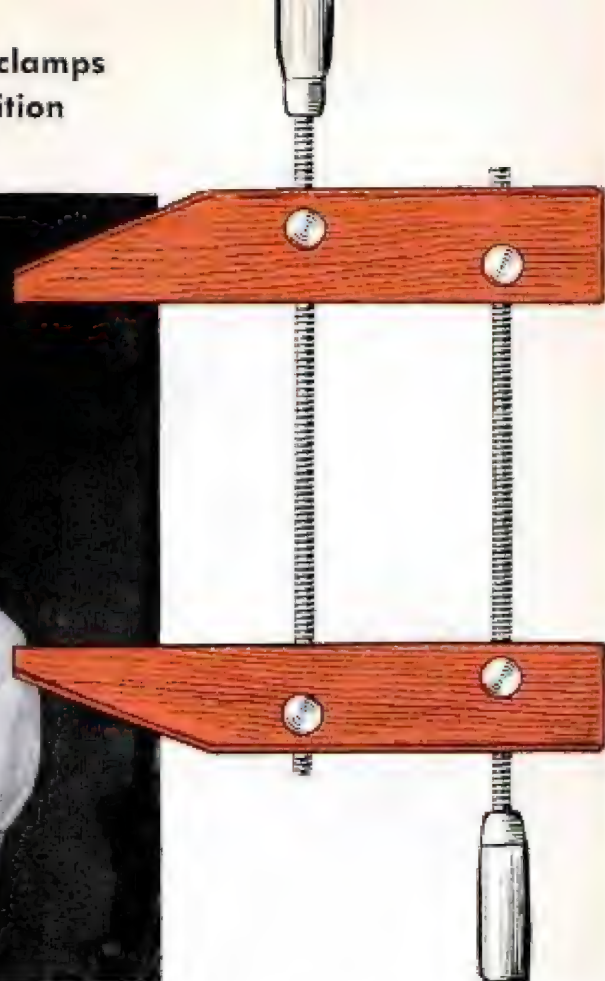
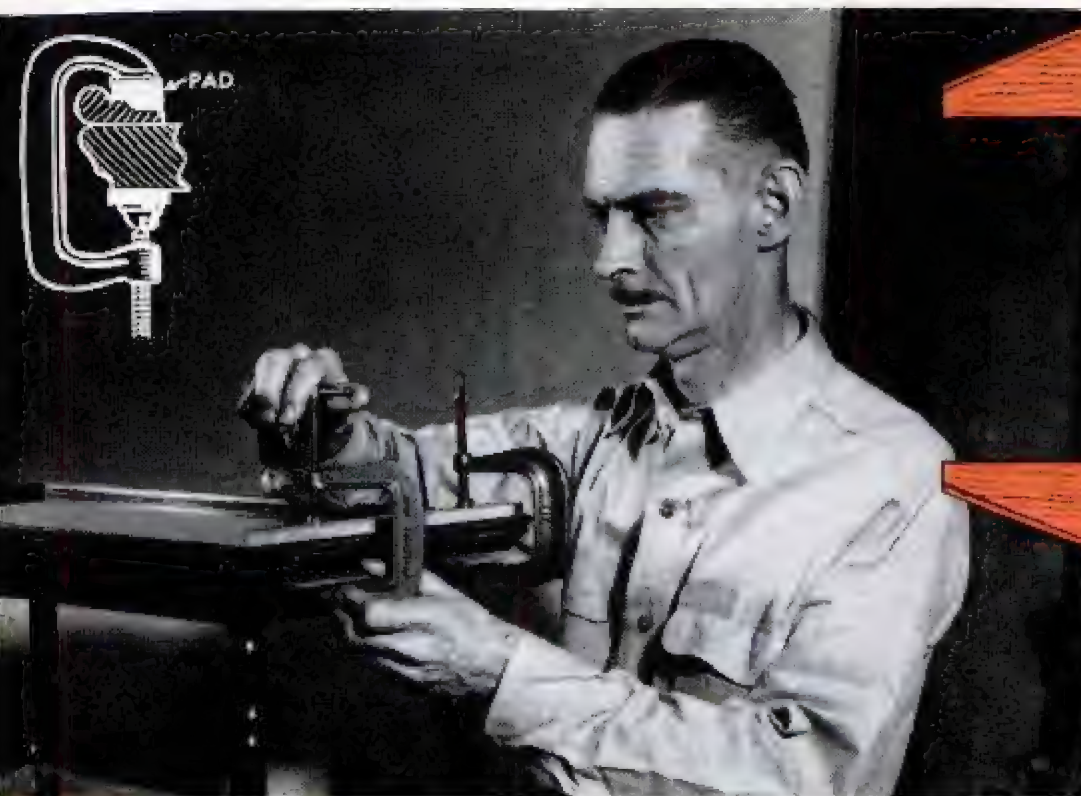


An ordinary nut can be made into a lock-nut by slotting it at an angle approximately three-quarters of the way through, and drilling a blind hole near one edge to take a tiny pin as shown. As the nut is tightened, the sides of the slot are forced together due to the offset pin, causing the threads of the nut and bolt to bind and thus "lock" together.—Max Schuelke, Milwaukee, Wis.

Sorry . . .

An article entitled "Floor Fan Doubles as End Table," published in the May issue of *Popular Mechanics*, is a patented item of commerce made by the Diehl Manufacturing Co., and may be purchased at appliance stores under the trademark "Diehl"

Glued work requires that pressure be applied by clamps to close the joints tightly and hold them in position



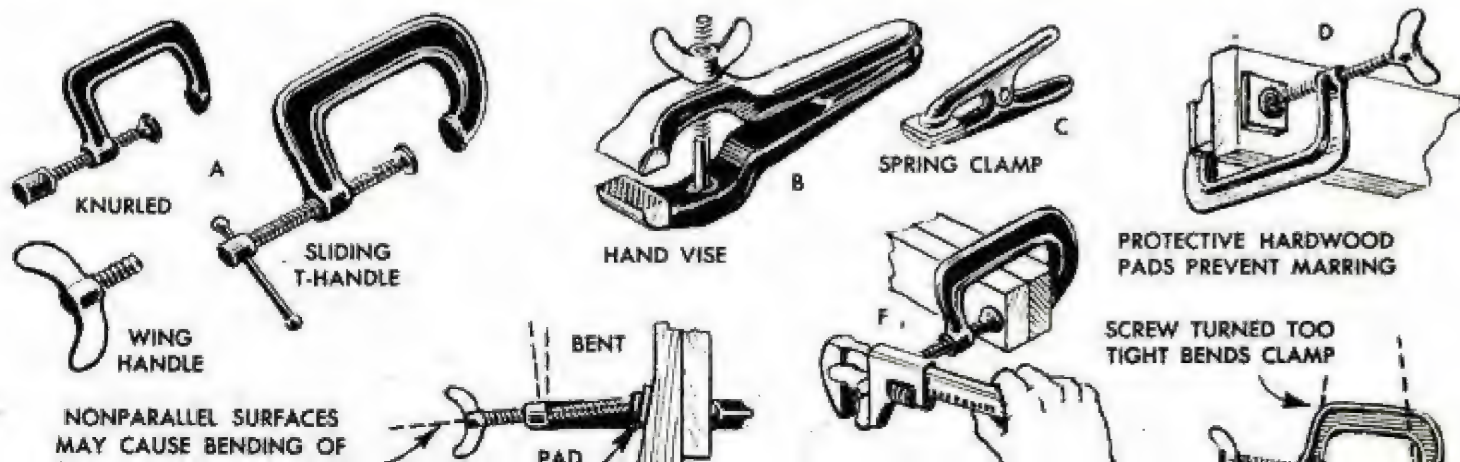
Holding Work with CLAMPS and WEDGES

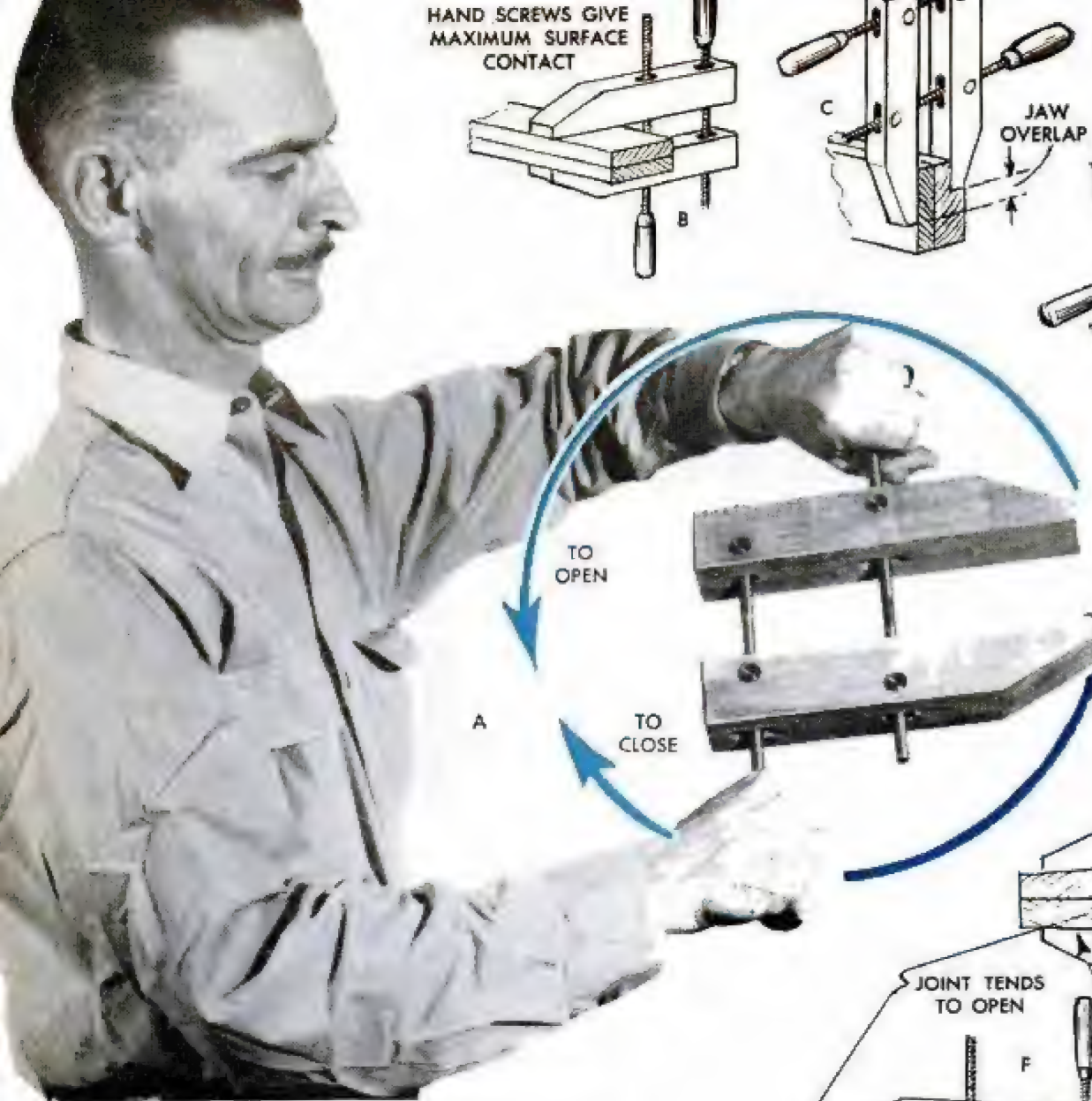
By E. R. Haan

SMALL PARTS that are to be joined by gluing often can be clamped in the bench vise, but larger and longer pieces joined edge-to-edge or face to face require the use of clamps suited to the size and nature of the work. Clamps of the various common types also are used for holding parts securely in position when assembling with other types of fasteners such as nails, screws and bolts.

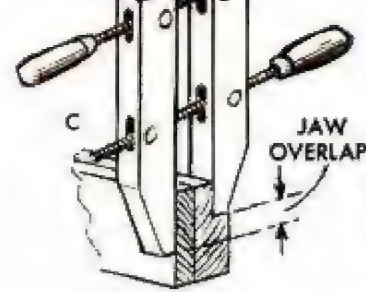
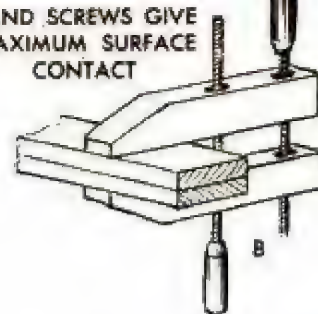
C-clamps: The C-clamp, detail A, Fig. 1, probably is used more frequently than any other clamp. Six of these in sizes that open from 2 to 8 in. generally are sufficient for the small shop. The smallest C-clamps have

knurled finger grips; larger ones have either fixed wings or sliding T-handles. For holding small assemblies that must be manipulated in various positions, a hand vise, detail B, is often most convenient. The jaws separate by spring action as the screw is released. A spring-type clamp for small work is shown in detail C. Sizes having jaw openings from 1 to 3 in. are available. On C-clamps only the swiveling pad at the end of the screw and the fixed pad on the frame contact the work. In some cases it's best to place small blocks of wood or hardboard between the pads and the surface of the work, detail D, Fig. 1, to prevent

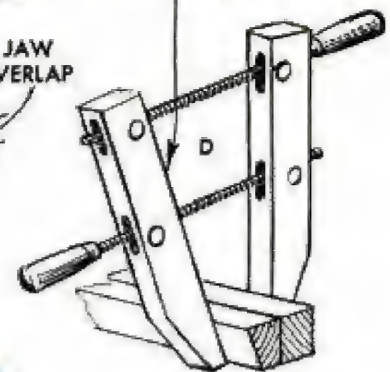




HAND SCREWS GIVE
MAXIMUM SURFACE
CONTACT



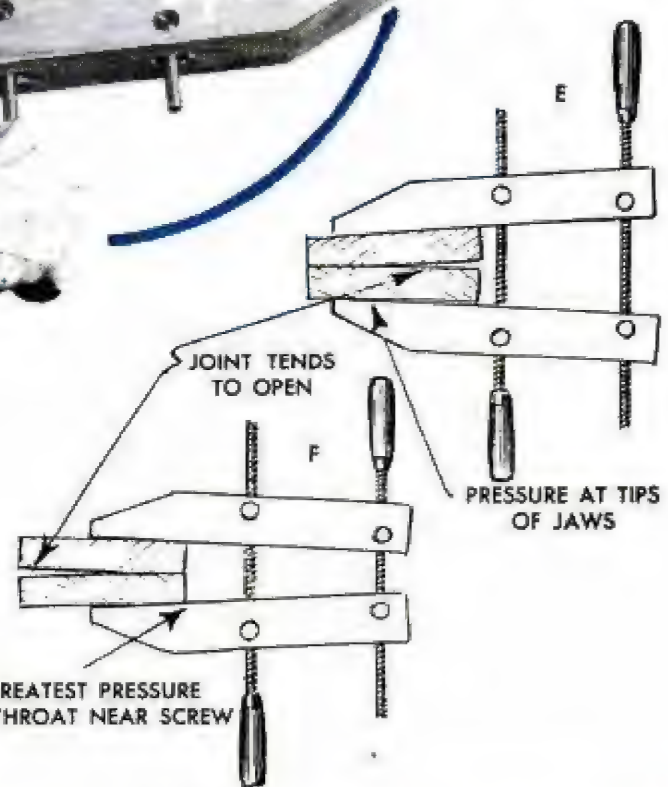
JAWS SET AT ANGLE
CLAMP BEVELED WORK



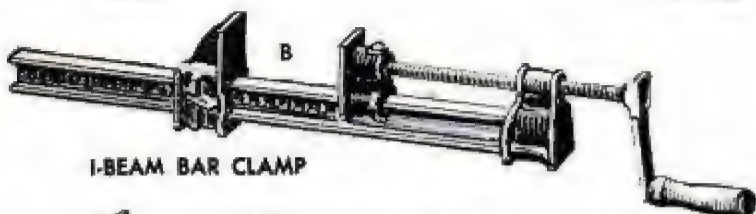
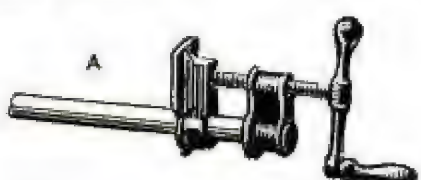
SCREWS PIVOT IN
METAL INSERTS

2

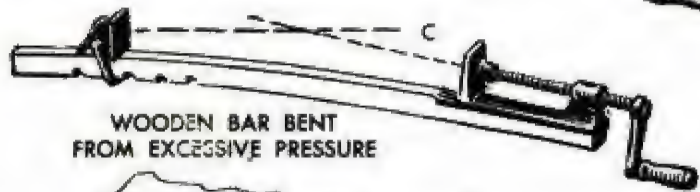
HANDSCREWS



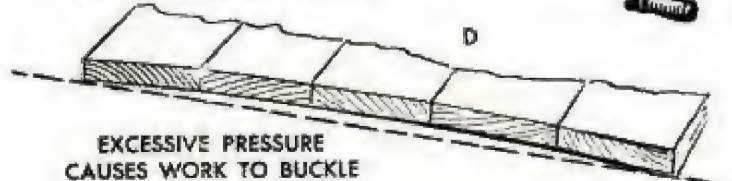
PIPE-BAR
CLAMP



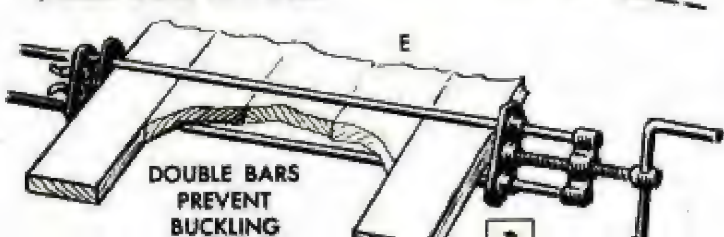
I-BEAM BAR CLAMP



WOODEN BAR BENT
FROM EXCESSIVE PRESSURE



EXCESSIVE PRESSURE
CAUSES WORK TO BUCKLE



DOUBLE BARS
PREVENT
BUCKLING



marring or denting. C-clamps should be applied only to parallel work surfaces. If these are at an angle as in detail E, the clamp pad may slip as indicated by the arrow. This can bend the screw and frame out of alignment when considerable pressure is applied. Too much pressure on C-clamps may bend them as in detail F.

Hand screws: Hard-maple hand screws often are preferred to C-clamps on woodwork. To open or close the jaws of a hand screw quickly for approximate spacing to suit the work, grasp both screw handles and turn them simultaneously by swinging the jaws around as shown in detail A, Fig. 2. After placing the jaws over the work, adjust them as required. Hand screws grip the work over a much larger contact area than C-clamps, as shown in detail B.

There are two types of hand screws; the nonadjustable type in which the screws are always at right angles to the jaws, and the adjustable type in which the screws thread through metal inserts that pivot in the jaws. The adjustable hand screw can be set with one jaw advanced farther than the other one as in detail C. Also, they can be clamped on surfaces that are not parallel, detail D. Nonadjustable hand screws must be used only on work having parallel surfaces. Incorrectly clamped work is shown in details E and F.

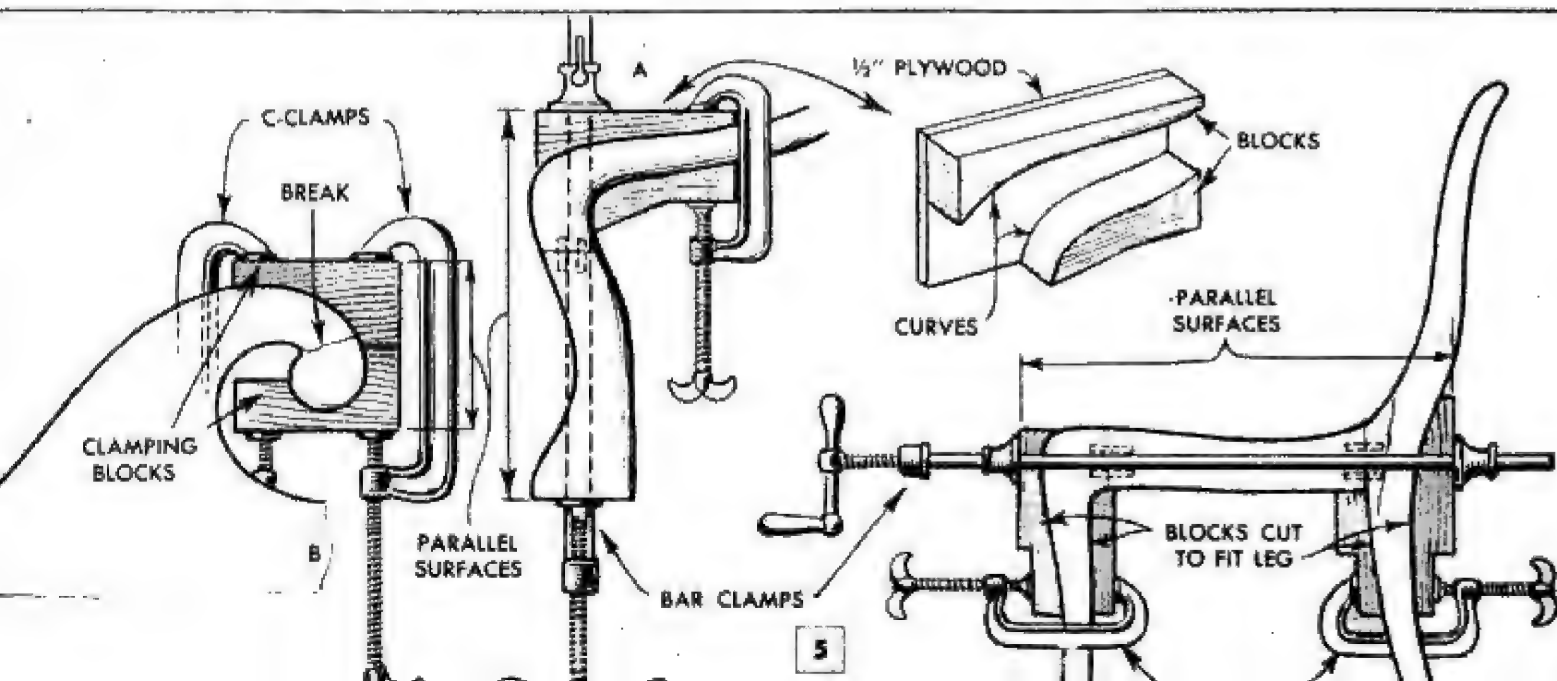
Bar clamps: For wide work beyond the range of a vise, C-clamps or hand screws, use bar clamps as in Figs. 3 and 4. As the metal jaws are likely to mar the work, protective pads should be used. Fig. 3 shows three types of bar clamps. The one shown in detail A consists of a length of $\frac{3}{4}$ -in. pipe turned into the crank-screw fixture which has a movable jaw. A sliding jaw fitted with a camming lock can be set at any point along the pipe bar. Detail B shows a bar clamp on which the sliding

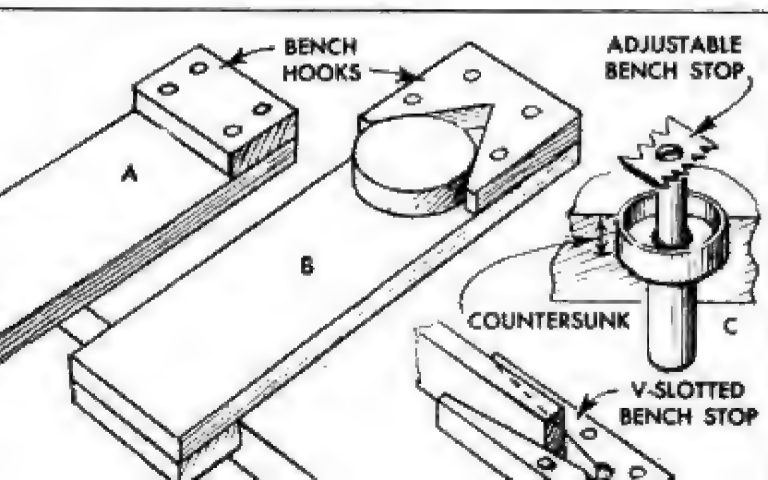
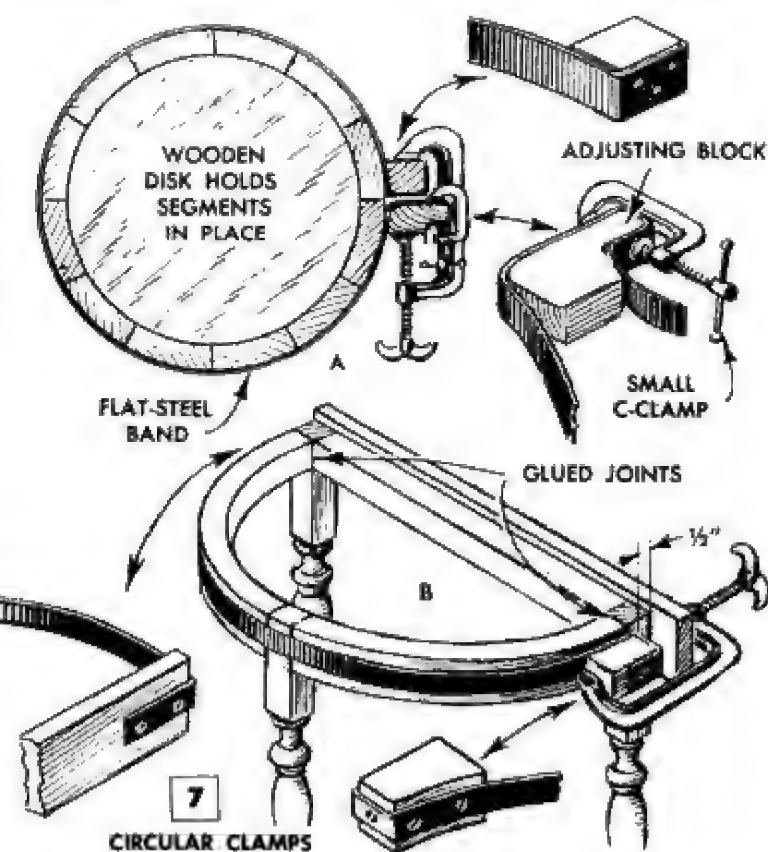
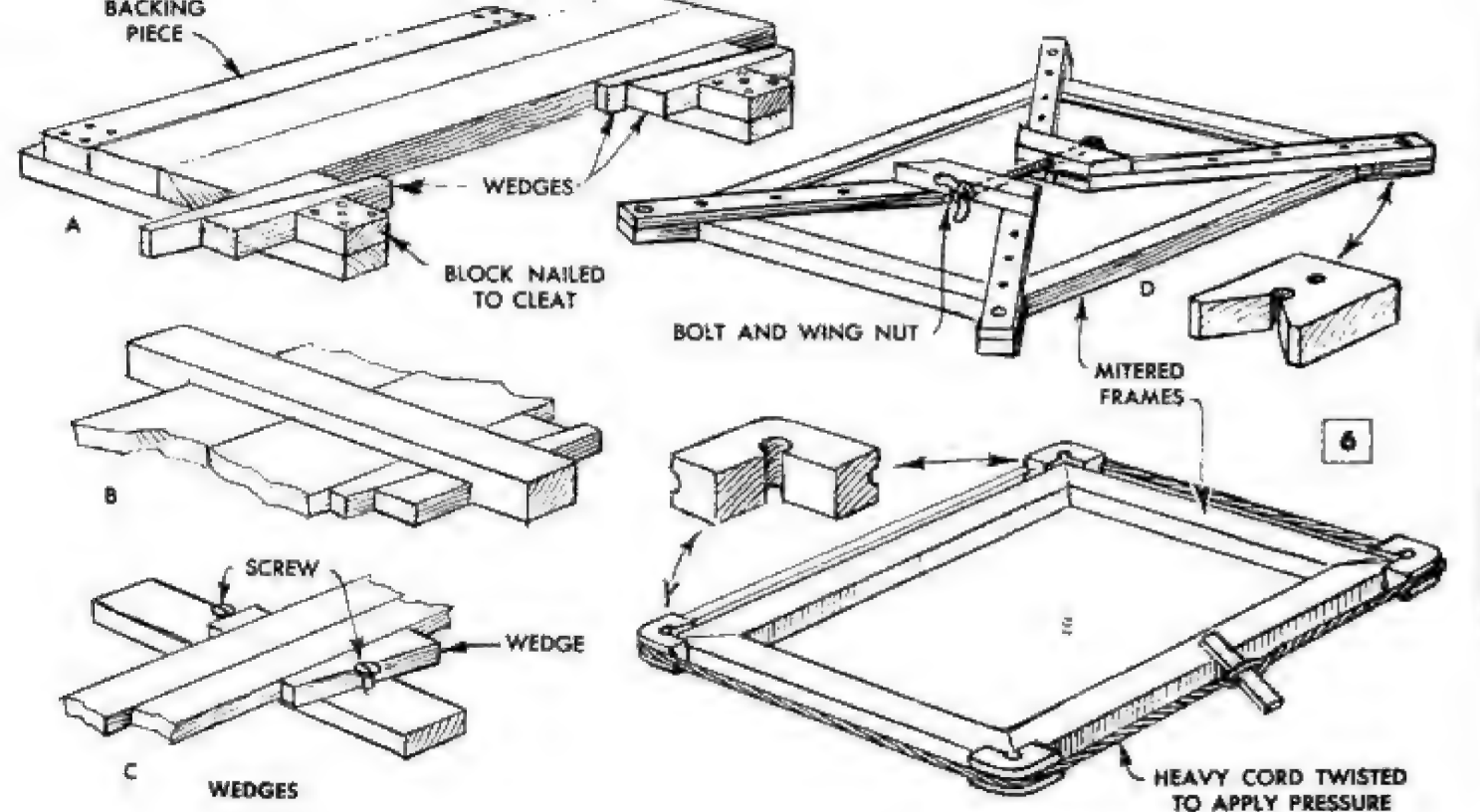
jaw locks by means of a pawl in any one of a number of notches formed in the web of the I-beam bar. These clamps come in lengths from 2 to 6 ft. Clamps having wooden bars will bend if too much pressure is applied, detail C. This causes the work to buckle as in detail D. Buckling of work also may result when using bar clamps in perfect condition, if the edges of the workpieces are not jointed at right angles to the sides. A type of bar clamp that assures a straight assembly of glued-up stock, such as that intended for a table or bench top, is shown in detail E. The jaws of this clamp slide on two parallel rods that bear against both sides of the work and thus prevent it from buckling.

Clamping irregular work: The surfaces on which bar or C-clamps are applied must be straight, parallel to each other and at right angles to the line of thrust, as shown in Fig. 5. To prevent a clamp from slipping on surfaces not parallel to each other, especially curved surfaces, use wooden blocks sawed to a matching contour. Their outer surfaces must be parallel and they must be arranged so that they will not slip.

Detail A shows the arm of a chair clamped to its vertical support. Two blocks, sawed to fit the curvature on both sides of the arm are held on a piece of plywood. The lower one extends downward to serve as a stop to keep the upper one from sliding out of position. A C-clamp holds the blocks on the arm, after which a bar clamp is applied to exert pressure on the glued joint.

Detail B shows how C-clamps are used to hold a split block around the end of cracked scrollwork. Another application of clamps is shown in detail C where curved legs of a chair are held tightly against the side rail after regluing the doweled joints. In this case the plywood





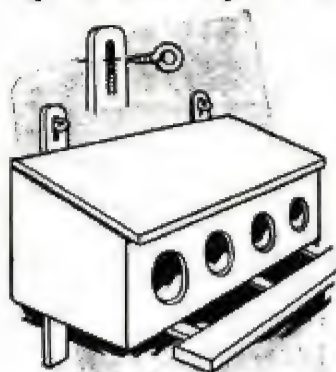
tie pieces are omitted since the outside blocks are not likely to slip. Note that the outer block on the rear leg nests in a long reverse curve, which prevents movement.

Improved clamping methods: When clamps are not available or cannot be used, you can improvise wedge clamps to hold the work as in details A, B and C, Fig. 6. Square or rectangular frames having mitered corners may be put under firm pressure by means of the clamping methods shown in details D and E. A number of wooden segments built up to form a ring or cylinder may be held together tightly with one or more thin steel bands of the kind commonly used for packaging large cartons, detail A, Fig. 7. One end of the band is nailed to a hardwood block and a second curved block is held at the other end by a small C-clamp which permits adjustment. A semicircular piece of work may be clamped to a straight piece in much the same manner, detail B.

Bench hooks and stops: A bench hook, details A and B, Fig. 8, prevents work from sliding when the thrust of a tool is applied, as when sawing, planing, chiseling and sanding. Detail B shows a bench hook having a V-shaped cutout in the cleat to support round work.

Where a long board must be held lengthwise for planing, chiseling or other operations, and it cannot be held in a vise, a bench stop is convenient. The disappearing type, detail C, Fig. 8, is preferred. Where wide boards must be held on edge securely, use a block having a narrow, tapered V-slot as in detail D. This may be fastened to the bench top with screws or bolts with wing nuts. ★ ★ ★

Nesting Boxes Held on Wall By Screw Eye "Turn Buttons"



When mounted on slotted cleats that fit over large screw eyes which have been driven into a wall or partition, the nesting boxes in a chicken house can be removed easily for cleaning and disinfecting. Simply turn the heads of

the screw eyes to a vertical position for removal. To secure the boxes once again when cleaning is completed, the screw eyes are turned horizontally.

Hand-Filed Keyway in Pulley Aligned by Drilling Hole

In an emergency requiring the hand-filing of a keyway in a gear or pulley, one way to get accurate alignment is to first drill a hole slightly smaller than the width of the finished keyway, as shown. To keep the drill from running into the shaft hole in the pulley, force a snug-fitting rod into the hole. This rod should be of the same hardness of metal as the gear or pulley to keep the drill from drifting. A slight flat filed on the rod beforehand will allow the drill to cut an open groove which can then be quickly filed square for the keyway. Clamp the pulley when drilling so that neither the pulley or rod move.—Morris Scott Dollens, Los Angeles, Calif.



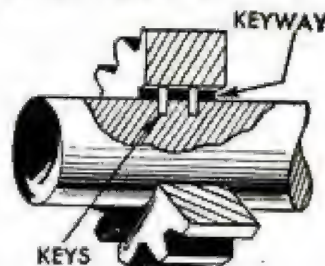
Small End Mill Improvised From Combination Drill

Less expensive and ordinarily available in smaller sizes than the smallest end mills, a combination countersink and center drill can be adapted for use as a small-diameter end mill to cut slots, grooves, etc. This is done by grinding the point flat, and then grinding a clearance angle on each cutting edge. The improvised cutter will work best at high speeds, using a shallow cut and fine feed. When working in steel, a good cutting oil should be flowed over the tool.

F. Shelford, Los Angeles, Calif.

Gear Keyed to Shaft With Pins

Lacking a keyway cutter for slotting the end of a shaft, I drilled two adjacent holes in the center of the shaft to take steel pins that serve the same purpose as a



"key." To assure locating the holes on the exact center line of the shaft, the latter was mounted in a lathe and scored horizontally with the point of a turning tool by moving the carriage back and forth. Following this, two punch marks were made $\frac{1}{2}$ in. apart on the line and a $\frac{1}{4}$ -in. hole, $\frac{3}{8}$ in. deep, drilled at each mark. The pins, each of which are $\frac{5}{8}$ in. long, were cut from $\frac{1}{4}$ -in. drill rod and driven into the holes. It's a good idea to use collars on both sides of the gear to prevent creeping.

Fred Alkire, Santa Barbara, Calif.

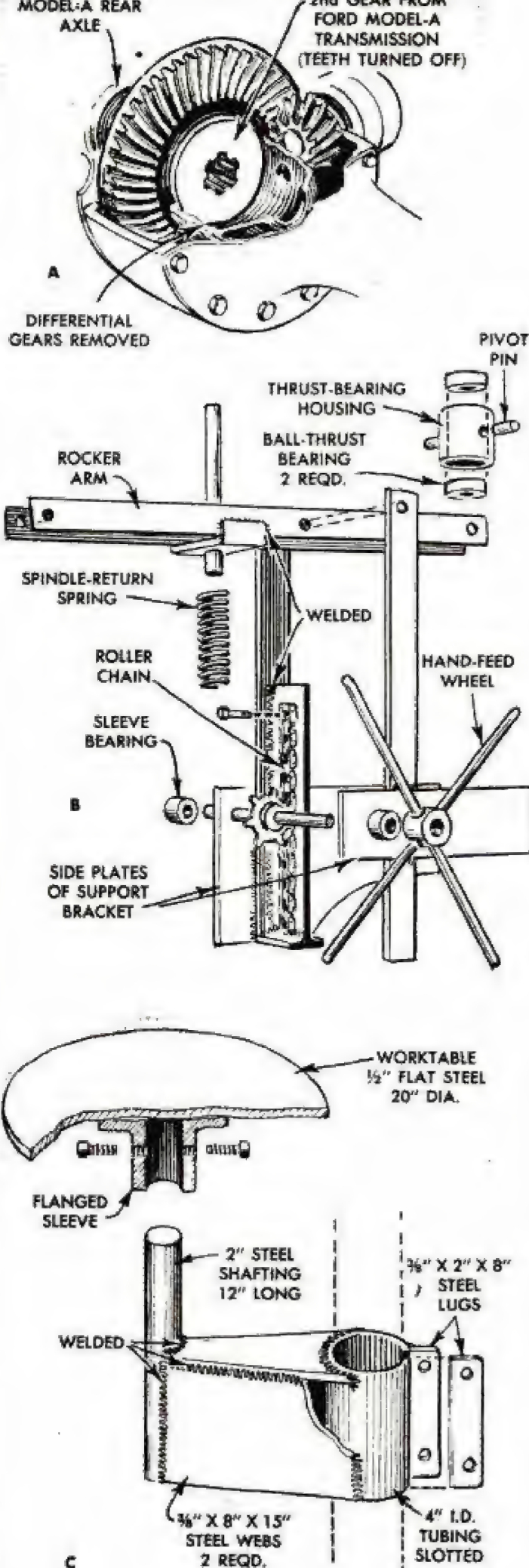
HEAVY-DUTY DRILL PRESS *from auto parts*

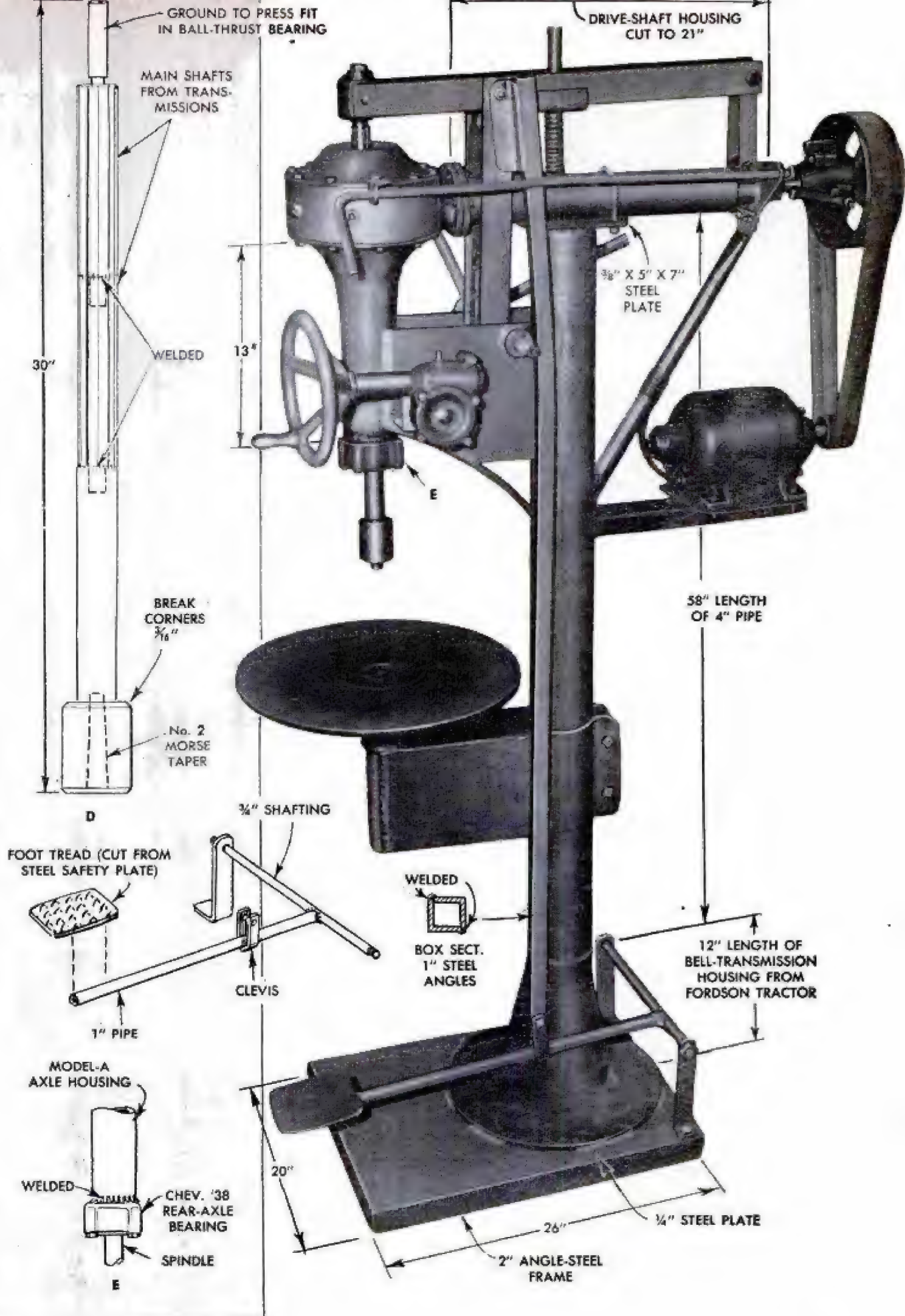
By L. H. Houck

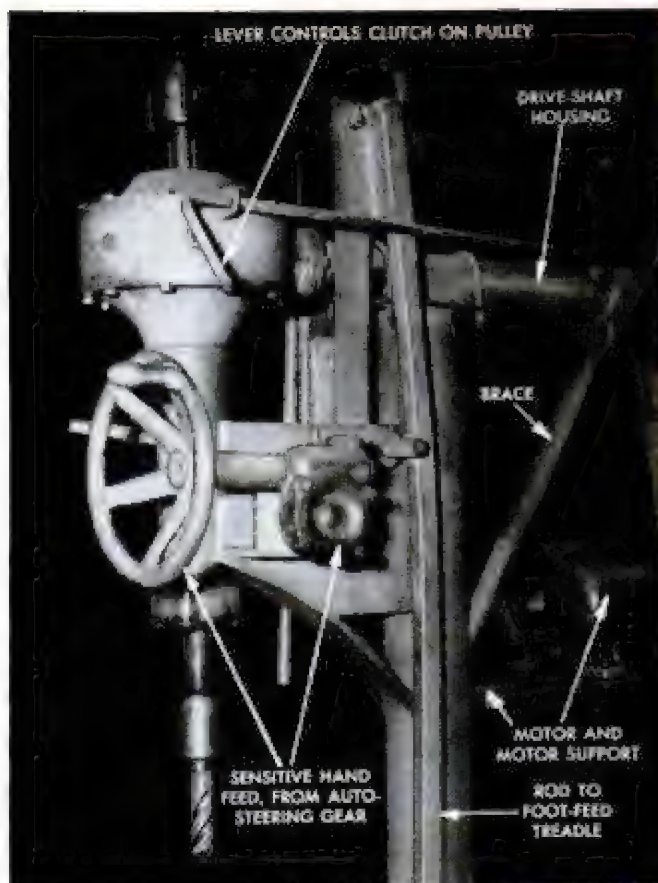
THIS FLOOR-TYPE drill press was designed and built by William Martin of Eldon, Mo., for heavy work in his own service shop on both metal and wood. The unit stands 74 in. high, has a spindle range of 5 in. and drills to the center of a 22-in. circle. Auto and tractor parts and stock sizes of angle, flat and round steel were used in the construction. As originally built, the spindle is bored to a No. 2 Morse taper to take Morse-taper drills and adapters. By turning a taper on the spindle nose, various types of chucks can be mounted.

Usually it's best to begin the construction by building up the base and column first. The base consists of a rectangular angle-steel frame welded at the corners. This is covered with a $\frac{1}{4}$ -in. steel plate welded to the frame. A 12-in. length of the bell housing from the rear axle of a Fordson tractor forms the lower end of the 70-in. column. The bell end of the housing is welded to the base. A 58-in. length of 4-in. pipe (4-in. o.d. steel tubing is better, if available) welded to the upper end of the bell housing completes the column. Care must be taken to weld these members together in line.

The spindle drive utilizes a portion of the drive shaft and the bell housing of a Ford Model-A rear axle. This unit must include the drive shaft and the differential. The wheel spindle is not required as the drill spindle is substituted in the assembly. The drive-shaft housing is cut to 21 in. long and the bell housing to 13 in. as indicated. A portion of the drive shaft must project beyond the housing so that a driving pulley can be mounted. Before assembling on the column, the Model-A rear axle is disassembled, the differential pinions removed and the second gear from a Model-A transmission is annealed and turned down so that it can be forced into the hub of the differential gear as in detail A. This forms the splined hub which rotates the splined drill spindle and at the same time permits it to be raised and lowered. The spindle is built up as in detail D, using two shafts from Model-A transmissions and also a length of wheel spindle from a '38 Chevrolet



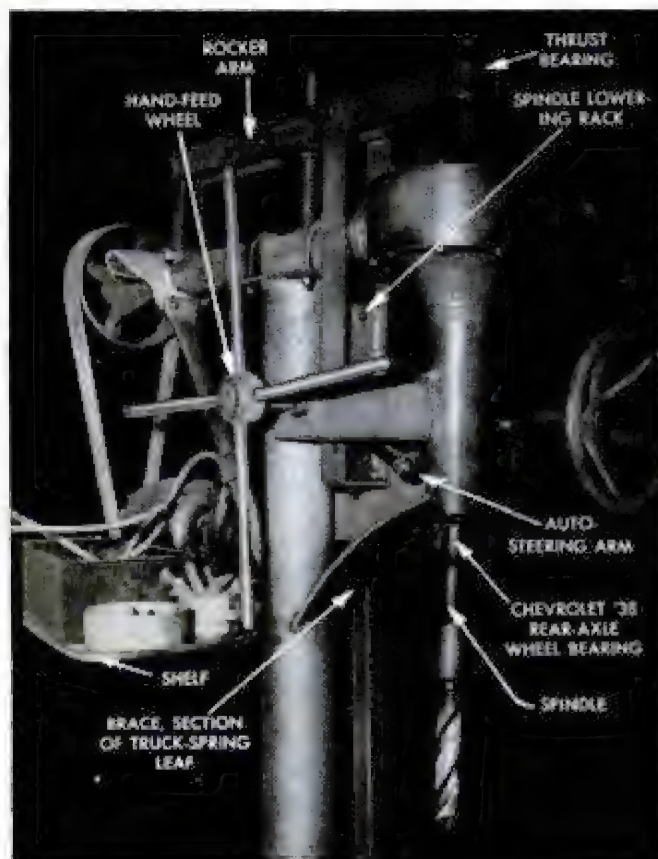




Photos courtesy Lincoln Electric Co.

This view shows the sensitive hand feed. Turning hand wheel moves the steering arm which contacts the spindle lowering rack as in the photo below. Gives sensitive feed for small drills but is not essential in average work. Can be omitted if desired

Rear brace from column to drive-shaft housing carries one end of lever controlling pulley clutch. When using plain V-pulley, bracket is omitted and brace welded directly to drive-shaft housing. Note position of shelf which provides handy storage space



rear-axle assembly. These three sections are welded together. A fourth section, 2 in. in diameter and about 3 in. long, is added to give an over-all length of 30 in. Note that the top end of the assembled spindle is shouldered and the projection ground to a press fit in the thrust ball bearings which fit into a housing as in detail B. An alternate construction is to assemble the two splined sections as in detail D and substitute a length of 2-in. dia. steel shafting for the lower section. This is shouldered down to a diameter that will fit a '38 Chevrolet rear-axle bearing. The latter, together with the housing, or seat, is welded to the lower end of the Model-A axle housing as in detail E. The opposite end of the spindle is cut off square and a front-wheel spindle with bearings is welded to it to form the thrust bearing. In most cases the wheel hub can be utilized as a housing with very little alteration, except that pivot pins must be inserted in holes drilled in the housing to take the drilled ends of the rocker arms, detail B. In either case taper-bore the lower end of the spindle as in detail D, and break the corners of the enlarged section $\frac{3}{16}$ in. as indicated. When fitting the spindle be sure that it slides freely in the splined differential hub and in the lower spindle bearing.

A $\frac{3}{8} \times 5 \times 7$ -in. steel plate welded to the top end of the column serves as a mounting pad for the spindle-drive assembly. Drill $\frac{3}{8}$ -in. holes near the four corners of the pad for $\frac{3}{8}$ -in. U-bolts. Then locate the assembly so that the spindle centers approximately $11\frac{1}{4}$ in. from the side of the column. Tighten the U-bolts temporarily. Now measure for size and cut the side plates of the support bracket, detail B. Dimensions of these are not given as the size must be determined after assembling parts to this stage. Weld to the housing and column as in the photo on the preceding page. Weld short steel or bronze sleeves to the side plates and drill through the plates to form bearings for the sprocket shaft, detail B. Note that the sprocket, detail B, engages a length of roller chain bolted to the web of the built-up slide. When fabricated and assembled, this unit forms a raising and lowering rack for control of the spindle by means of the hand-feed wheel. Note its position in the lower photo at the left. In the assembly a flat-steel cross member (not shown) is welded between the side plates to serve as a guide and to prevent the slide from swinging forward.

The hand-feed wheel is made by welding four $\frac{1}{2}$ -in. steel rods of equal length to a steel sleeve which forms the hub. The wheel is locked to the sprocket shaft with a setscrew. The spindle-return spring is

placed over a length of shafting welded to the top of the drive-shaft housing. A short length of steel channel welded to the rocker arms serves both as a spacer for the arms and as a pad for the upper end of the spring. The pad is center-drilled and the hole elongated for a loose fit over the shaft. The rear ends of the rocker arms are bolted to links, the lower ends of which pivot on a bolt passing through a short length of $\frac{1}{2}$ -in. pipe welded to the drive-shaft housing. This arrangement equalizes the necessary lateral movement of the rocker arms when the spindle is lowered.

The forward ends of the rocker arms are drilled to fit $\frac{3}{8}$ -in. steel pins which are a drive-fit in holes drilled in opposite sides of the thrust-bearing housing. Also the upper extensions of the lowering rack are bolted to the rocker arms as in the photos on the opposite page. Note in the upper photo, page 216, that the rod to the foot-feed treadle is welded to an angle-steel bracket attached to the rocker arm by the same bolt that holds the lowering-rack extension.

With the assembly complete to this stage, braces to the rear end of the drive-shaft housing from the column, and from the bell housing to the column are welded in place. The latter is a section of truck-spring leaf and is welded only to the right-hand side plate as pictured. The remainder of the assembly will be quite clear from the photos and details. The table and its sliding bracket, detail C, are built up from stock materials in the manner indicated. It will be noted that the size of the sliding clamp is given as 4-in.-i.d. tubing. This will slide easily over 4-in.-o.d. tubing, but if pipe is used for the column it will be necessary to make up a special clamp from flat steel. The sensitive hand feed, upper photo on page 216, consists of an auto-steering gear and a salvaged handwheel. Turning the latter brings the steering arm to bear on the lower end of the spindle-lowering rack as in the lower photo, opposite page. This arrangement gives an extremely sensitive feed, but is not essential in ordinary work. For this reason it can be eliminated if desired. The photos also show a flat-belt drive from the motor to a clutch pulley on the drive shaft. A V-belt drive is equally satisfactory. A clutch-type pulley is not essential for average work. The $\frac{1}{2}$ -hp. motor pictured is bolted to a mounting plate which is in turn bolted to a channel-steel bracket welded to the column, and the lower photo at the left shows a shelf which is welded to the motor bracket. This provides convenient storage space for drill bits and other accessories. As a final step, assemble the treadle and bolt to the base.

★ ★ ★

Crate Raised to Insert Rollers With Bent Spring Leaf



Much of the difficulty of raising a heavy crate for moving on rollers can be overcome by using part of an old automobile-spring leaf bent at a right angle as shown. In use, the tapered end of the spring leaf is forced under one end of the crate while the other end is pushed to the floor with the feet, thus leaving the hands free to manipulate a roller into position. After the roller is positioned properly, foot pressure on the tool is released gradually until the crate rests on the roller. The tool then is removed and applied to the opposite end of the crate.

File Used First on Soft Metal Will Give Longer Service

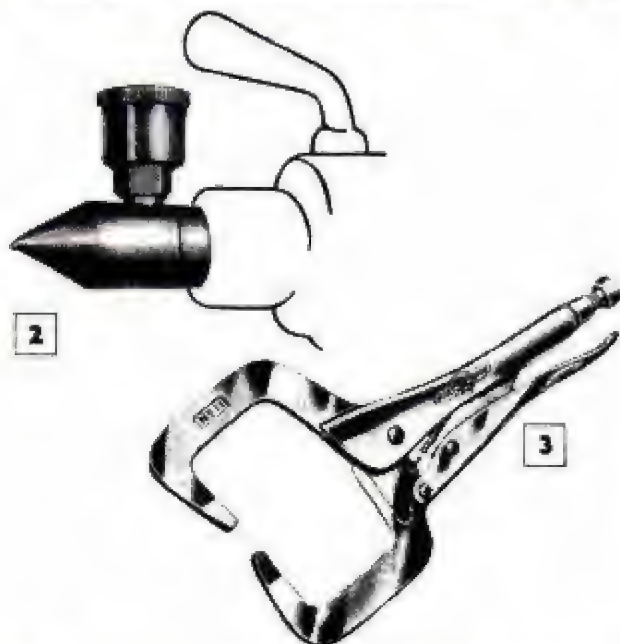
A new file will give longer service if used at first only on soft metals such as brass and copper, after which it still will be sharp enough for filing iron and steel. Should immediate filing of one of the harder metals be found necessary, the file may be used on one side only, while the other side is marked to reserve it for soft metals until it, too, becomes worn. An easy way of marking it is to daub it lightly with red finger-nail polish.





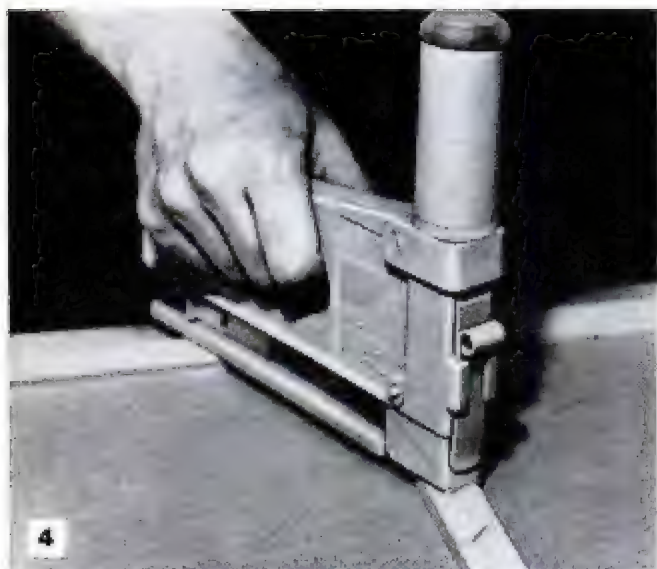
SHOPPING FOR TOOLS

1. SOUND DETECTOR is especially sensitive to sounds which cannot be distinguished by the human ear. These can be picked up and amplified to the point where they are easily identified. Sound is transmitted directly to earphones by a sensitive probe which can reach any point accessible to an ordinary pencil. Picks up the sound of leaking valves, wrist pin and bearing knocks, grinding gears and other mechanical defects



2. PRESSURE-LUBRICATED CENTERS for lathes and grinding machines prevent damage to precision work caused by heating. Centers are tipped with a special alloy for long wear and resistance to scoring. Lubricant is supplied from a pressure cup through a pin-sized jet in the center point. This method of pressure lubrication prevents metal chips and abrasive dust from collecting on the surfaces in contact

3. TOGGLE C-CLAMP is operated in a manner similar to pliers and has an adjustment which permits pre-setting the jaw opening to suit the work. After pre-setting the jaws, the operator can manipulate the clamp with one hand. By utilizing this feature it is possible to hold an assembly for welding, brazing or soldering without having to clamp it to a table or in a special fixture. Locks securely in any position



4. AIR-OPERATED TACKER works on 40 to 80-lb. air pressures and can drive more than 200 staples per minute where the nature of the work will permit this speed. Has a simplified direct drive, loads from the front and takes staples in a variety of metals and finishes from 5/32 to 13/16 in. long. Light weight combined with specially shaped handle permits one-hand operation at top speed without undue fatigue

5. MAGNETIC PROBES retrieve metal chips, tools, bolts and other objects dropped into inaccessible places. Handy for machine assemblers, auto mechanics, electricians and others who assemble parts. Probes come in several sizes, the long probe pictured having a flexible shaft, or body, which enables the operator to lower it into curved pipes or tubes. Powerful permanent magnets pick up heavy bolts and nuts easily

5





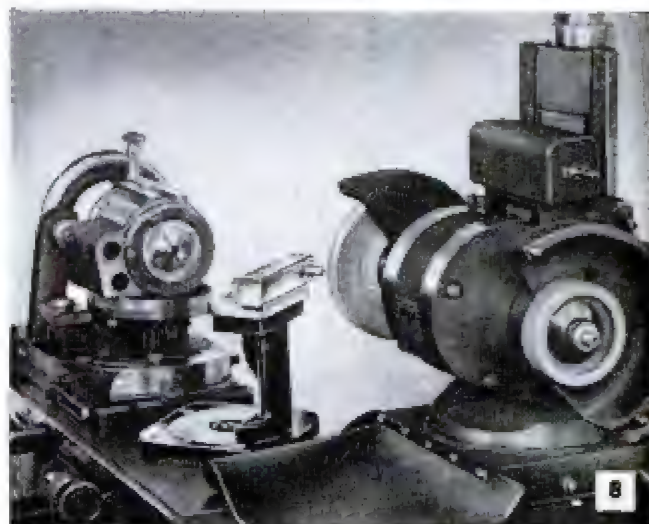
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6. HOLE GAUGE reads to .0001, is self-centering in any internal work within its adjustment range. Available in two sizes, the smaller having a measuring range from .275 to .500 to a depth of 2 in. or 6 in. with extension. A larger size has measuring range from .500 to 4 in. to depth of 9 in. with extension



7

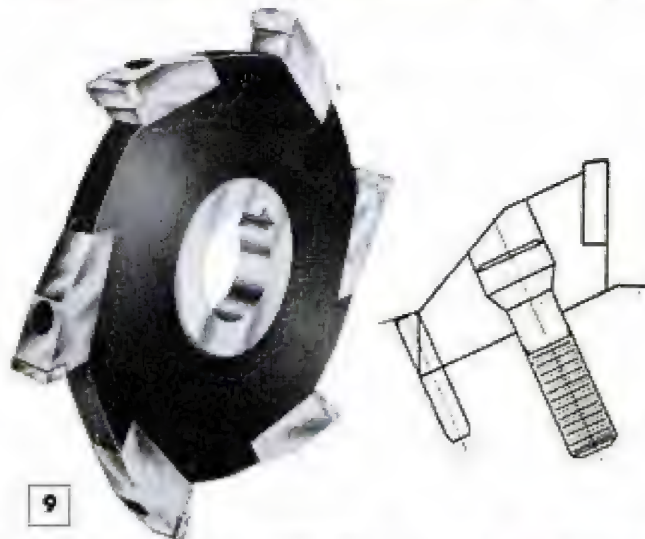
7. CHAMFER MICROMETER measures end diameters of chamfers up to 1 in. and from 0° to 90° . Depth of chamfer is easily computed from readings. A master check bar with known end diameter and chamfer is included with each unit for checking calibrations. Instrument offers machinists substantial saving in time



8

8. ANGLE GRINDING-WHEEL DRESSER is especially designed for use on radial relief grinders, but can also be used on cutter grinders of various types. Has a graduated base and 5-minute vernier for precision setup. Inverted milled T-slide permits dressing wheel on either side to any desired face angle

9. REPLACEABLE-BLADE MILLING CUTTER is available with choice of blades in carbide, high-speed steel or cast alloy. Rigidity of solid cutter is obtained by seating replaceable blades against abutments milled on the periphery of the new-type head. A dowel accurately locates the tail of each blade in the head



9

10. RESISTANCE GAUGES determine comparative drawing quality and stretcher-strain characteristics of sheet metal without damaging the piece being tested. Material is flexed at corner and gauge shows resistance to bending. A test with the second gauge shows the curvature of the bend and stretcher strain



10

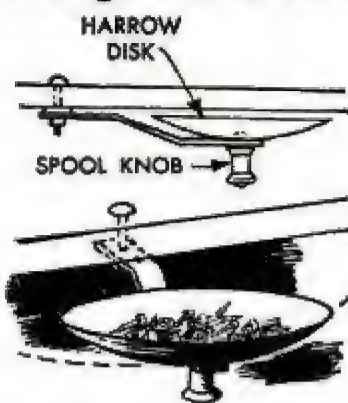




Plowshare Held for Repairs In Adjustable Pipe Rack

This adjustable rack, which holds plowshares conveniently for welding, repointing and hard facing, was made from the window-cranking assembly of an old car as well as other scrap parts. The cranking assembly was welded to a short length of pipe that pivots in the upper end of a pipe stand. The plowshare is held in the rack by means of a simple clamp. The crank tilts the plowshare to the angle most satisfactory for the job involved, and simplifies angular adjustments during work.

Harrow-Disk Storage Tray Swings Under Bench Top



A discarded harrow disk bolted to a flat-steel bracket pivoted to the bench top makes a handy swinging tray for the farm-shop bench. The shape and size of the disk make it especially useful for storage of small parts of

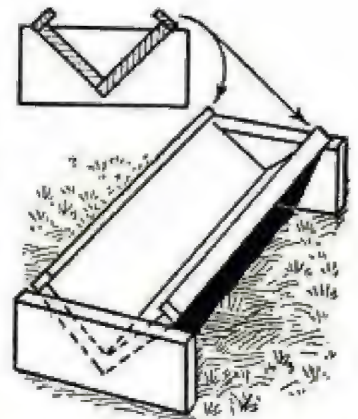
various sizes, also screws, nails, bolts and nuts. Use $\frac{3}{8}$ or $\frac{1}{2}$ -in. flat steel for the bracket and bend an offset in the piece which is approximately equal to the concavity of the disk. Then bolt the bracket to the bench top, placing a large washer between the top and the bracket to permit free movement. Nick the bolt threads with a cold chisel so the nut does not loosen. A large spool attached to the bottom of the disk as shown, makes a good handle.

Metallic Paints Cut Radiator Heat

Metallic paints, such as aluminum and bronze, may reduce the heating efficiency of a radiator as much as 20 percent, according to heating experts. Paints of this type have heat reflecting qualities and thus tend to reduce passage of heat from the outer surface of the radiator. For more efficient heat radiation, the experts recommend painting the radiators with a regular oil-base paint.—A. E. Fenn, Chicago.

Lip on Feed Trough Reduces Waste

To cut down excessive waste from ground spillage in feed troughs, one farmer formed a lip on each side of the trough as illustrated. He cut pieces of $\frac{1}{2}$ x 2-in. stock to fit the length of the trough sides and nailed them to overhang the edges. The lips thus formed



do not in any way interfere with feeding, and yet effectively cut down on spillage.

Norm Jacky, Fond du Lac, Wis.

Tap Hand-Started Accurately

To eliminate the difficulty of starting a tap accurately by hand, I made this jig which is drilled in graduated sizes for guiding taps in holes that are at right angles to the surface of the work. Each hole in the jig, which is made from a 2 x 3-in. block of $\frac{1}{2}$ -in. cold-rolled steel, is reamed slightly larger than the diameter of the corresponding tap. After the jig has been drilled, it is hardened to prevent the taps from wearing and enlarging the holes. In use, the jig is placed on the work so the proper guide hole is centered over the hole to be tapped. When possible, the jig should be clamped to the work.

Henry Sevcik, Los Angeles, Calif.





Movies indoors or out

For indoor movies just attach Kodak's Photo-Light Bar (only \$8.75; lamps, \$2.70 for two) . . . set and shoot. That's all there is to it!

Color movies, too

30-to-40-scene Kodachrome Film costs but \$3.95 a roll (8mm.)—including processing! (Only \$3.25 for black-and-white.)



Exposure guide "delivers the goods"

Built-in exposure guide takes out all the figuring, leaves only the fun . . . makes sure exposure's right every time!

Most exciting family gift of all ... a Kodak Movie Camera

CINE-KODAK RELIANT CAMERA

Moderately priced, but it has lots of advanced features . . . makes slow-motion movies, accepts telephoto lens. Uses economical 8mm. roll film for movies with snapshot ease, at snapshot cost. With f/2.7 lens, \$89.50. With f/1.9 lens, \$110. See the "Reliant" at your Kodak dealer's.



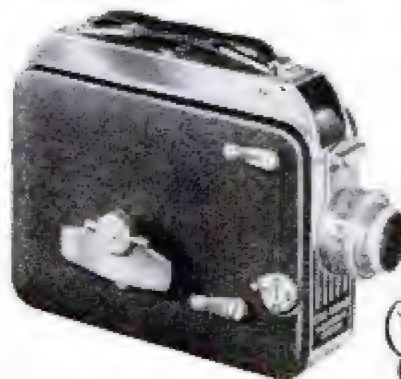
"It's Kodak's budget special"



Brownie Movie Camera

Most economical way to crisp, clear movies in full color or black-and-white. Uses 8mm. roll film. Features easy, no-thread loading, built-in exposure guide. With fine, fast f/2.7 lens, \$39.75. With super-speed f/1.9 lens, \$49.50.

"Men sure go for this one!"



"Here's versatility plus"

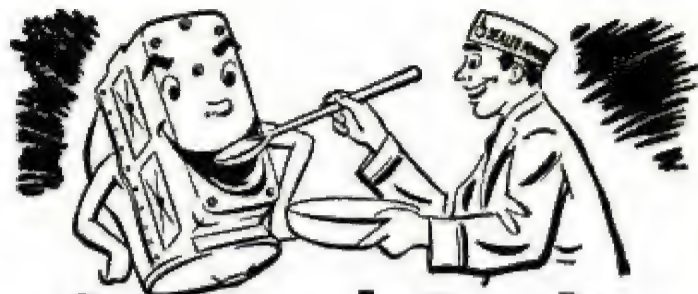


Cine-Kodak Magazine 8 Camera

Loads in 3 seconds with magazines of 8mm. film. Accepts telephoto lenses; has many luxury features. With f/1.9 lens, \$160. For really BIG movies, ask to see the "Royal," Kodak's finest personal 16mm. movie camera. With superb "Ektar" f/1.9 lens, \$176.25.

Prices include Federal Tax where applicable and are subject to change without notice.

Kodak



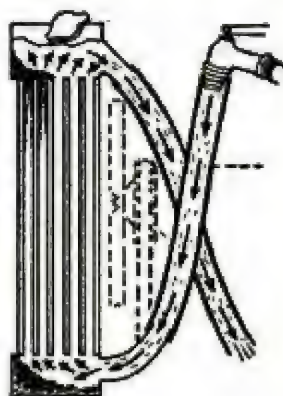
Care and Feeding of Engines

BY S. P. CORP

COOLING SYSTEM CARE

All that water you put in your radiator during warm weather contained lime and minerals. These, combined with engine heat, form scale such as you see in the bottom of a teakettle, as well as rust. Scale and rust in the engine block will form hot spots in the water passages. Carried over into the radiator, they clog tubes.

Reverse-flushing of the cooling system should be a seasonal maintenance operation. Do this by removing upper and lower radiator hoses to reverse flush water through radiator. With radiator cap removed, this flow will clear tubes and allow clogged material to drain out at top of radiator. Or you can leave cap on and carry flush stream away through hose attached to upper opening. *Do not apply pressure until water begins to flow through, then use only normal pressure.* If radiator is clogged, use a pulsating flow. The commercial method uses a flushing gun which supplies air agitation to loosen rust and scale.



When radiator is clear, connect radiator hose and add a good cooling system cleaner. Run engine until temperature is from 160° to 200°, then stop engine and drain system again, being sure to open drain cocks on side of engine block. Again flush system until clear water comes out of drain cocks.

In extreme cases, remove water distributor tube and thermostat before reverse-flushing cylinder block. On old cars you may need to remove core hole plugs from block.

After thorough cleaning, add rust-inhibitor to the cooling water. Good anti-freeze solutions already contain rust-inhibitors. Avoid salt-base or petroleum-base anti-freeze solutions, as they cause corrosion and deterioration of radiator hose.

FREE BOOKLET ON CAR CARE

Write for free illustrated booklet on car care, "MORE POWER, Less Gas, Less Oil," which contains many valuable suggestions. When you re-ring, insist on Sealed Power KromeX Full-Flow Ring Sets to fight heat, friction, corrosion, and abrasion. These sets contain the famous MD-50 Steel Oil Ring, the only ring with the Full-Flow Spring, best for oil control even in badly tapered and out-of-round bores, for easier starting and thousands of extra miles. Sealed Power Corp., Dept. G-11, Muskegon, Michigan.

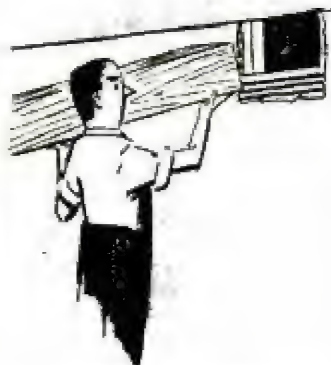


Clinic for Homemakers



As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.

Sagging Ceiling



Q—Recently I purchased an older-type home and now I'm wondering what to do about the ceiling in the living room which has sagged about 2 in. near the center, cracking the plaster badly. Apparently the room was enlarged at some time and no support was installed where the partition was taken out. Plaster also is cracking upstairs in two rooms.

Of course, something must be done, but what? I don't want to partition the living room if it is avoidable.—P.R., R.I.

A—Why not consider the installation of ceiling beams? These can be solid, rough-hewn from the log or timber, or they can be built up by boxing a 4 x 6 or 4 x 8-in. timber with stock which matches the window and door trim. You did not give the room area or ceiling height, but as a rule beams that must support weight should be spaced not less than 60 in. center-to-center, and the ends must be adequately supported on ribbands mortised into the studs. Another method, often advantageous in supporting the ends of a heavy beam, is to cut the studs and install headers, thus forming a pocket for the ends of the beam. Another arrangement which is generally attractive in a rectangular room considerably longer than it is wide, is to install a heavy center beam and then locate smaller beams, equally spaced across the ceiling in both directions from the center. This placement of the beams has the effect of dividing the ceiling. In your case we would suggest that you consider the latter method, as the center beam must be relied on to support the ceiling as a substitute for the bearing wall which has been removed. Of course, the ceiling must be raised on jacks before installing the beam.

Musty Odor in Upstairs Rooms

Q—We recently moved into an old house and ever since have been troubled by a persistent musty odor in the upstairs rooms, particularly in the clothes closets. Nothing seems to eliminate it. Ventilation, deodorants of various types apparently have little or no effect. Clothes closets are unpainted but the rooms are papered. There is no sign of dampness. Can you suggest any remedy?

M.S., Minn.

A—We'd guess right away that the trouble is due to aging plaster. It also could be caused by a slow decomposition of the paste used in applying the wallpaper. Homemade paste and wall size sometimes cause this trouble. However, the fact that

(Continued to page 224)



OLD TIMERS KNOW the value of a reliable, smooth-running, long-lasting motor. They get all this and much more in the all-new G-E Utility Motor for shop, farm and home!

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Now available through your local dealer—the completely new G-E Utility Motor gives you more for your motor dollar! Packed with more power per pound, it's smaller, lighter, easier to handle, mount and wire! You can use it with shaft up,

down or at any angle — it will maintain the right lubrication and *no* oil leakage! Designed for home workshops by the world's biggest motor manufacturer, why take less? Ask your dealer about the all-new G-E Utility Motor today!

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Send me the new 16-page booklet that gives general tips on motor selection and tells about the all-new G-E Motor.

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Greatest little tools for making things fit—work—look the part of expert craftsmanship! Whether it's a mechanical toy, metal decorative piece, clock repair, or model of your inventive brain-child, these ingenious hand instruments are just the thing for taking "bugs" out and putting neatness or operating smoothness in.

Nicholson X.F. (meaning *Extra Fine*) Swiss Pattern Needle Files come in 12 assorted shapes for performing most any delicate filing operation. They're as accurately made as many of the fine instruments themselves that professionals turn out.

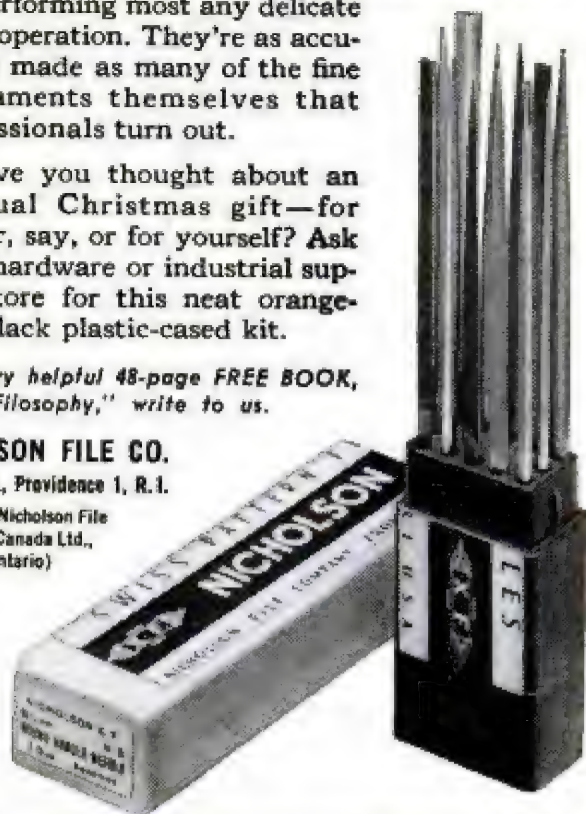
Have you thought about an unusual Christmas gift—for Junior, say, or for yourself? Ask your hardware or industrial supply store for this neat orange-and-black plastic-cased kit.

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NICHOLSON
FILES FOR EVERY PURPOSE

(Continued from page 222)

the odor is most apparent in the clothes closets suggests that it is the plaster that is at fault, rather than the paper adhesive. Unfortunately, the remedy is not so simple, especially if the plaster in the closets is very old and rather porous. The step that would seem most likely to prove successful is to sand the walls and ceilings of the closets lightly to smooth the surfaces and then apply an undercoater of the type used under oil-base wall paints. Two coats may be necessary to seal the surface effectively. Then follow with two coats of oil-base wall paint. An alternative is to cover the walls with red-cedar closet lining. Remove the paper from the room walls and ceilings, wash thoroughly to eliminate all traces of paste. Then apply undercoater and paint.



Paint Failure

Q—The paint on the north side of my house is very finely checked. It had been painted only a few months before I moved in and is now three years old. Only the north side appears to be affected all over, but several spots on the east end of the building also are checked. What is the cause? Should I remove the old paint before repainting?

P.B., Del.

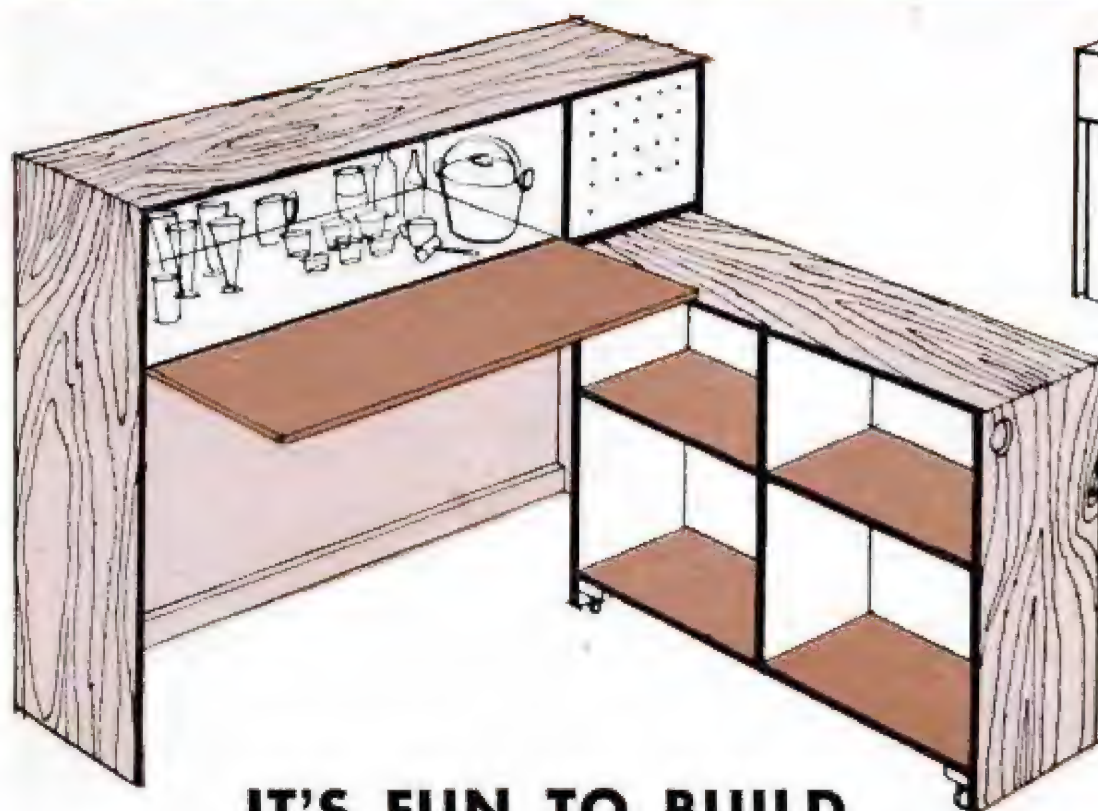
A—If we understand your description correctly, the cause is a wet undercoat, that is, the first coat over the primer was not thoroughly dry when the second, or finish coat, was applied. Without a thorough examination of the surface at firsthand, it is difficult to say just what to do. We hesitate to suggest that you remove the paint back to the bare wood, as in most cases the defective paint film still is bonded firmly to the siding. When faced with this problem many homeowners have rented a portable belt sander from a local paint dealer and sanded the paint smooth before repainting. This usually proves a satisfactory procedure, although it is a rather tedious job. If you try sanding in the manner suggested, we would caution you to wear a respirator of the type designed to prevent inhalation of fine dust.



Leak at Flashing

Q—My home has a large inside chimney. Lately we've noticed during heavy rains, that water apparently seeps through the chimney and dampens the plaster in two upstairs rooms. So far I have been unable to determine just where the water is coming from. Is it possible that the flashing is defective?—F.N., Wis.

A—We think you have the answer when you mention a defective flashing, although it is possible there is a leak in the chimney itself. However, this is less likely, especially if the flue is tile-lined. Frequently a leak in the chimney flashing is difficult to locate. You did not say whether your chimney comes through the roof at the ridge or below it on either side. If the chimney is below the ridge, then the first place to search for a leak is on the upper side. In some cases you may be able to locate the leak by examining the chimney from the attic. If there is an opening, even though it is very small, it will show clearly against the light from above. Insert a length of wire in the hole so you can locate it from above. How the repair is made depends on the type of flashing that has been used. If a galvanized-metal flashing has been used and rust has eaten through the metal, then the parts affected must be replaced. However, a small opening can be sealed with roofing cement and the rest of the flashing painted.



IT'S FUN TO BUILD THIS CABINET BAR!

—COLOR-TONED WITH *Rez*

Closed, it's a smart cabinet ... open, it's a versatile bar or utility unit. Perfect for your rathskeller, porch, patio ... anywhere in your home. Fun to make ... costs little. Send for detailed plans today.

Use Rez in finishing the unit. Rez—which primes, seals and gives you the natural wood finish decorators recommend.

Rez Color Tones, such as the Cedar Rez shown here, bring you ultramodern natural colors: *Redwood, Cedar, Sage, Driftwood, and Mahogany.* White Rez provides a 1-coat blond finish. Just put it on and wipe with a cloth. *Clear Rez* beautifies grain in the original wood color.

You can paint like a professional with Rez. Brushes, sprays or wipes on like water ... can't leave streaks or brush marks.

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So many places to use Rez! Paneling, siding, flush doors, fencing, furniture ... wherever you want a modern natural wood finish. See the beauty of Rez Color Tones soon.

Ask your dealer for color samples!

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MAIL COUPON AND 25¢ CASH FOR PLANS

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Enclosed find 25 cents (25¢) for which please send plans and specifications for Cabinet Bar (Monsanto Rez Moderns, Plan No. 9).

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Street

City Zone State



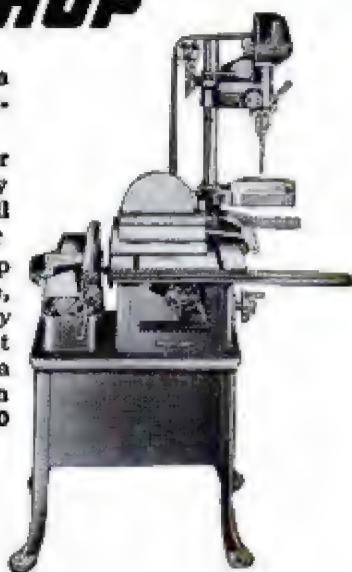
LOOK FOR THIS DELTA WINDOW IN YOUR TOWN

1 DELTA SHOP

Four most basic Delta Homecraft Tools in a compact one-motor unit:

- big capacity 8" circular saw with tilting blade; husky 4" jointer; standard 11" drill press; versatile disc sander

Does 95% of all home-shop operations. Keep it anywhere, use it anywhere. All tools ready—no adjustment nuisance. Get it all at once or one tool at a time. Price, complete with stand—less motor . . . **\$229.50**—a low price for Delta quality.



2 BAND SAW

Ideal for curve cuts, inside and out; and for straight cutting of heavy stock. A natural No. 5 tool for the well equipped shop. Price . . . **\$54.50**—a low price for Delta quality.

3 SCROLL SAW

For cutting intricate patterns, fret-work; both inside and outside cuts. Youngsters love the scroll saw—safety features make it an ideal "learning tool." Price . . . **\$43.50**—a low price for Delta quality.



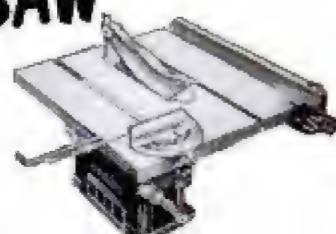
4 DE LUXE JOINTER

Husky precision jointer noted for safety. Puts on a perfect "finish" edge with one easy pass. Planes surfaces up to 4" width; also does many extra jobs. Price . . . **\$59.50**—a low price for Delta quality.



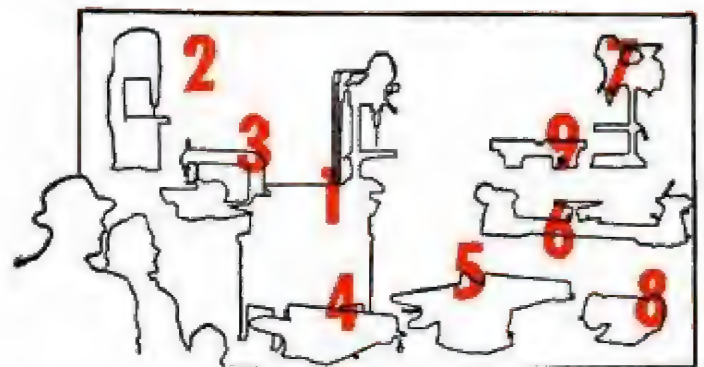
5 ECONOMY SAW

Circular saw with tilting table instead of tilting blade. Accurate saw for basic cutting at minimum cost. Price . . . **\$44.50**—a low price for Delta quality.



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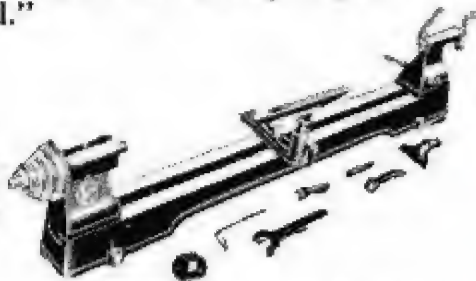
A whole lifetime of enjoyment is wrapped in every one of these famous Delta Homecraft Tools—and how well you know it! Any one of them is a welcome gift—as fine tools as money can buy, yet priced for any budget. If you're a veteran shopman, here are tools to complete your equipment, a scroll saw, drill press, jointer, lathe, grinder or shaper. Or if you've just started, there's the DELTASHOP—a one-motor combination of the four basic, most-used Delta Homecraft Tools. All have this in common—they quickly pay for themselves by cutting home maintenance and repair bills and giving you the satisfaction of "doing a job like a professional."



Most probably this very window will be shown by one or more of your local stores. It will pay you well to find it. Pick out the tools you'd like to own—then be sure to bring the family and give them your "Christmas hint" early.

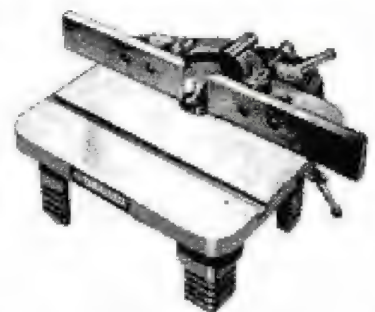
6 LATHE

For veterans who love to make their own designs, then turn them. No finer tool than this Delta Homecraft 11" Lathe. Price . . . \$64.50—a low price for Delta quality.



9 SHAPER

Make cope and reverse mouldings—sash, door and brick mouldings, base moulds, ornamental edges; a wanted tool for post-grad shopmen. Price . . . \$69.50—a low price for Delta quality.



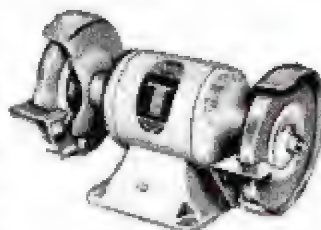
7 DRILL PRESS

Rugged, accurate "must" for every shop; the most-used tool—can be used to drill, route mortise, carve, many more. With Delta accessories, its usefulness is almost unlimited. Price . . . \$54.50—a low price for Delta quality.



8 GRINDER

This carefully engineered bench grinder keeps cutting tools sharp and bright. Can also be used to clean and buff. A real time and money saver in the workshop. Price . . . \$39.95—a low price for Delta



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Another Product of **Rockwell**



Prices slightly higher west of the Rockies

THE WORLD'S FIRST REALLY

QUIET

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"Quiet as a Cloud"

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Entirely New!

Entirely Different!

5½ Horsepower! No Vibration!

Revolutionary Quiet!

Full Gear Shift! FORWARD-NEUTRAL
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Mile-Master Fuel System!

Up-and-Off Motor Hood!

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A Beauty to Look at...

And a Dream to Drive!



THE NEW JOHNSON
SEA-HORSE 5½

This—you've got to try yourself—the new Sea-Horse 5½! There has never been anything like it!

It's *quiet!* So quiet that *conversation* now becomes a part of outboard boating. So quiet that it means the *eventual revolution of all outboard manufacture.* Motors that deafen are doomed!

And such silk-hat quality! *Vibration is gone.* No more transom chatter. No more plank-sting. Even the steering handle rests in your hand as still as a tiller.

Best of all, it's miraculously trained down to the size that most outboard users prefer. Same popular handling ease as its famous predecessor, the Sea-Horse 5—but even sweeter power—and more of it!

See your Johnson Dealer. Look for his name under "Outboard Motors" in your classified phone book.

FREE! Write for the new Sea-Horse literature that describes the greatest line of motors Johnson has ever built.

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THE NEW 1954 SEA-HORSES

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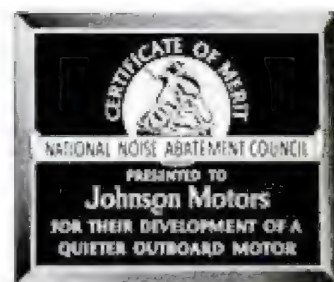
SEA-HORSE 25—25 hp. Only 99 lbs. Over 30 mph. It trolls! Everything deluxe... \$410.00*

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Johnson's revolutionary new outboard construction that isolates your boat from engine vibration. No jitter, chatter, throb, or noise.

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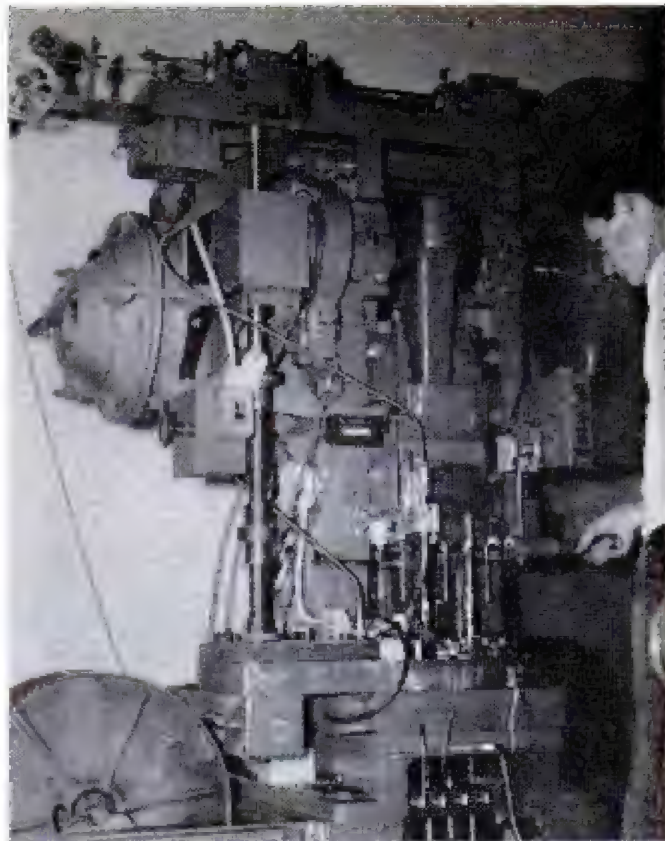


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Lead wire, unrolling from spool at left, is cut to length and pressed firmly into the finished jackets

Bullets Strictly for Bull's-Eyes

(Continued from page 130)

Using a 180-grain, .30-caliber bullet, he killed a rhinoceros with one shot in the head. This bullet, fired at a velocity of 3400 feet a second, had an explosive effect upon the two-ton beast. Formerly such dangerous game was hunted with extremely heavy, double-barrel rifles firing bullets weighing up to 500 grains at relatively low velocities.

Mr. Weatherby, testing this bullet on an eight-inch limb of a tree, literally cut it in two with one shot. The muzzle velocity of this bullet, if maintained for one mile, would carry it that distance in less than two seconds. And its muzzle energy (striking power) is 4400 foot pounds.

In the Sierra plant, a dozen experts supervise the automatic punch and die presses which turn out these little bullets at dazzling speed.

The first operation is that of the blanking and cupping press. Rolls of copper alloy from 2 to 2 $\frac{11}{16}$ inches in width and from .02 to .04 inch thick (depending upon bullet size desired) are fed into the machine, which punches out disks and forms these into cups at the rate of three per stroke. Its capacity is 20,000 cups per hour.

The cups then go through the next die press, which makes a series of four or five "draws" (the number depending upon the

(Continued to page 234)

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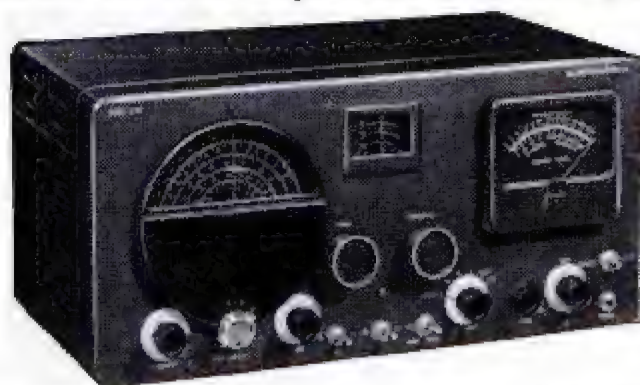


Model S-53A. The finest small communications receiver built and ideal where maximum performance is required in small space. Covers Broadcast Band 540-1630 kc plus four short-wave bands covering 2.5-31 and 48-54.5 Mc.

Electrical bandspread for easy tuning. Two i-f stage. Switches for automatic noise limiter, code reception and high-low tone. Phono jack for records. Headphones tip jacks on rear and built-in PM speaker. Temp. compensated to reduce fading due to frequency shift.

Satin black steel cabinet with brushed chrome trim. 12 $\frac{7}{8}$ " x 7" x 7 $\frac{3}{4}$ " deep. Ship. wt. 19 lbs. Piano hinge top. Seven tubes plus rectifier.

For 105/125 V. 50/60 cycle AC..... **\$99⁹⁵**



Model S-76. Double conversion receiver. Value packed communications receiver with Broadcast Band 538-1580 kc plus three short-wave bands covering 1720 kc-34 Mc.

Electrical bandspread tuning control with calibrated dial to separate stations on crowded bands. Double superhet with 50 kc second i-f and giant 4-inch "S" meter. Five position selectivity, one r-f, two conversion, two i-f stages, temperature compensated. Phono input jack. 3.2 or 500 ohm outputs. Socket for external power or remote control.

Satin black steel cabinet with chrome plastic trim rings. 18 $\frac{1}{2}$ " x 8 $\frac{7}{8}$ " x 9 $\frac{1}{2}$ " deep. Ship. wt. 41 lbs. Piano hinge top. Nine tubes plus voltage regulator and rectifier.

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Use R-46 speaker.



and Hear it All!

Now, at prices no higher than you'd expect to pay for ordinary radio, you can have all the thrills of short-wave reception, plus tops in regular broadcasts, too. You hear London, Paris, Rio, Moscow—hear ships at sea and planes in the air—police and military broadcasts—and you hear them *direct* with a Hallicrafters.

Hear amateur broadcasts from all over the world, and get in on the fun of the world's greatest hobby. And you'll hear them on the sets that these critical experts choose for themselves . . . Hallicrafters. For many years Hallicrafters has been first choice with amateurs, just as governments all over the world, including our own, have chosen Hallicrafters for critical communications.

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*World's Leading Exclusive Manufacturer
of High Fidelity and Communications Equipment,
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Now! A "Double-Lifetime" Used Car

that can save you hundreds of dollars!



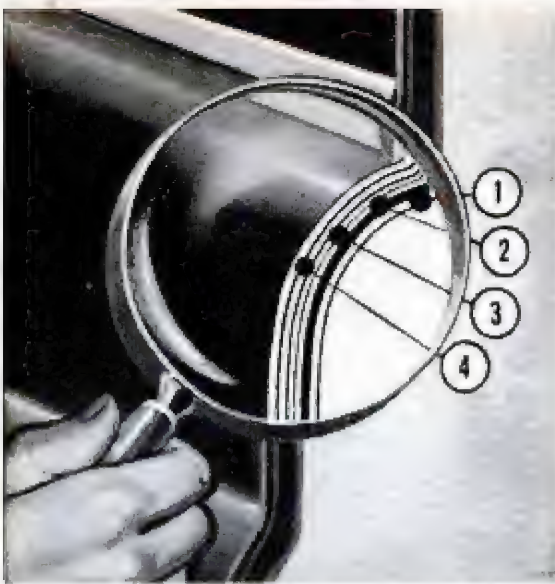
Yes, today there's a new used-car value—a car built with a "Double-Lifetime" to last years longer so it's like new even as a used car . . . costs you less to own and drive. That car is Nash!



When you buy a used Nash you get a car that is more economical—more fun to drive, *newer-looking, newer-feeling*—a *newer* car for your money.



Nash is America's safest car with body and frame welded into a single, rock-solid unit that can never loosen, rattle or squeak. Huge steel girders surround the passenger compartment, protecting you and yours.



Nash beauty *lasts*' (1) Metal is Bond-erized (2) for rustproofing, two coats of (3) primer sealer are baked 90 minutes. Two coats of (4) enamel are baked on to sparkle "like new" years longer.

Smoothest ride on the road with coil springs and stronger, rattle-free Air-flyte Construction. Ample road clearance, too, for those spots in the woods. Drive a postwar Nash for more fun at less cost.



**...AND YOU GET
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Nash Owners report more miles a gallon than owners of other make cars. Amazing gasoline savings are only one of the many economies you enjoy in Nash. Save on body up-keep and repair bills!



For real driving pleasure there's nothing like a Nash, with features that double the family fun—like famous Twin Beds that make up in seconds. With one bed made up, children can nap on trips.



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Airliner Reclining Seat—only in Nash—adjusts to comfortable, relaxing positions. And only Nash offers you Weather Eye—world's finest heating and ventilating system.

Nash

**The Car with the Double Lifetime
... Built to Stay New Longer**

Nash Motors, Division Nash-Kelvinator Corp., Detroit Mich.



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So quick and easy to
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Here's a project that everybody
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Be sure you get Werner Chromtrim in the red
striped wrap. Ask for it at your dealer. Also look
for Werner Alumiladders (effort-saving aluminum
ladders and step stools) and Alumidryers (rust-proof,
light-weight clothes dryers).

It's easy to turn out a smart, professional-looking
job with Chromtrim!

1 CUTS EASILY



No special
tools required.
Saws easily.

2 BENDS EASILY



Forms with
light hand
pressure.

3 APPLIES EASILY



Chromtrim
nails give pro-
fessional look.

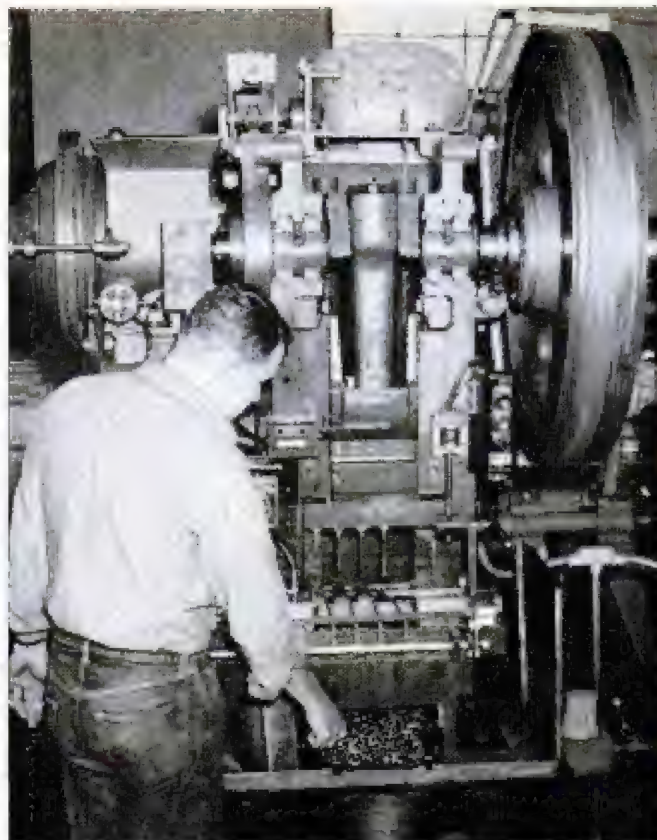
FREE—Send for your free copy of "Trim
It Yourself" booklet (also project plans).
Shows how to pick the right Chromtrim for
your needs and how to apply it.



Werner

R. D. WERNER CO., INC.
295 5th Ave., N. Y. 16, N. Y.
Dept. C17

CHROMTRIM



Copper cups are fed into die press which makes four
or five precise "draws" to form the bullet jackets

bullet size), to bring the jacket to the de-
sired caliber and length. This press forms
6000 jackets per hour.

Another automatic machine trims the
open end of the jackets to a tolerance of
.001 inch. Following this operation the jack-
ets are given a special bath to remove all
traces of lubricating fluid and any other
foreign film.

Next a robot machine takes over. This
multiple-purpose die press actually seems
to think for itself. While an expert operator
watches, six dies work at high speed to per-
form their magic. Through a long tube the
jackets are fed into the first die. Down an-
other tube slide the lead cores, cut to exact
length from a large coil of lead wire.

Down comes a plunger and the lead core
is inserted. Successive dies in the row take
over. The long, gracefully curved bullet
nose is formed, the tiny lead point extruded
and shaped precisely.

Finally, every bullet is microscopically
examined for the tiniest imperfection.

Bullet design has always intrigued bal-
listic engineers. An innovation in design
was the "boat tail" type, which tapers
sharply from the portion which bears on
the barrel.

This streamlining, it is believed, increases
velocity by reducing the vacuum behind
the bullet. And a bullet of this design pos-
sesses better balance.

With the higher speed thus obtained, the

(Continued to page 236)

NOW
a power tool that's

Really New!



SHOPMASTER'S

Sensational

20" JIG SAW

Self-Contained Motor

Think of it—this rugged 20-inch jig saw has its own built-in motor! Not a solenoid or a vibrator, but a full-rotating armature, powerful AC motor.

A rugged, professional power tool that cuts up to 2½" stock with ease, this newest of all power tools makes precision woodworking actually easy. Shopmaster's EXCLUSIVE COMBINATION MITRE GAUGE AND RIP FENCE accessory sees to that!

Want to rip? Just turn saw head 90°. It's that simple. Truly the most outstanding QUALITY power tool value on the market today!

with



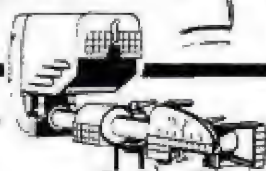
**Just plug
it in**

(Exclusive combination mitre gauge and rip fence available at slight extra cost.)

\$39⁹⁵
Motor included

Slightly higher in zone 2

**OTHER FAMOUS
SHOPMASTER
TOOLS**

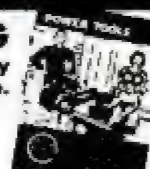


**FAMOUS UNIVERSAL
COMBINATION TOOL**

WRITE FOR FREE CATALOG

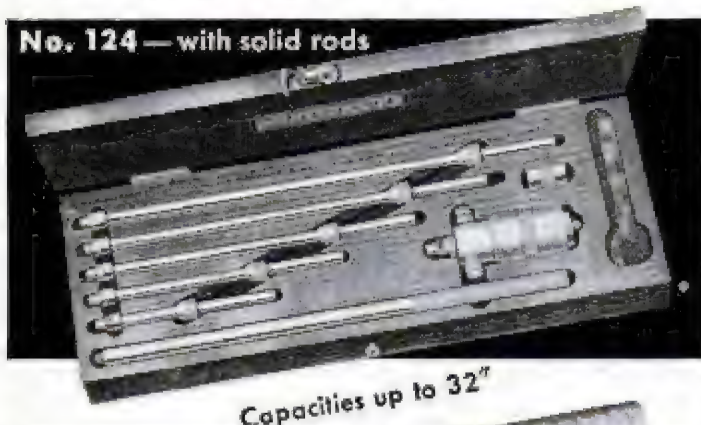
There's a Shopmaster power tool for every need. Write today for catalog of complete line.

SHOPMASTER, INC. Room 10E
1214 South 3rd St. • Minneapolis, Minn.

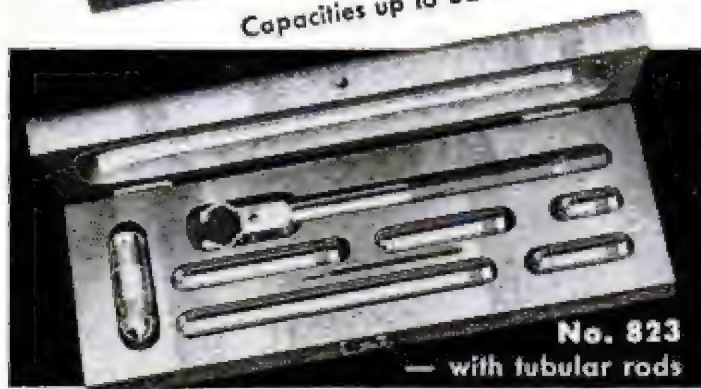


Starrett® Satin Chrome INSIDE MICROMETERS

No. 124 — with solid rods



Capacities up to 32"



No. 823

— with tubular rods

Choose your favorite from these two excellent inside micrometers. No. 124 has small diameter solid rods while No. 823 has light yet rigid $\frac{3}{8}$ " diameter tubular rods. Both have Satin Chrome Finish on micrometer heads to eliminate glare, retard corrosion, increase reading speed and accuracy... also, hardened and ground contact surfaces plus compensation for wear. See them today — at your Starrett Tool distributor's.

SEND FOR IT — ONLY 10¢

Starrett "Tools and Rules" Book shows the right tools for any measuring job. 50 pages, 100 pictures, helpful reference tables. Address Dept. AP



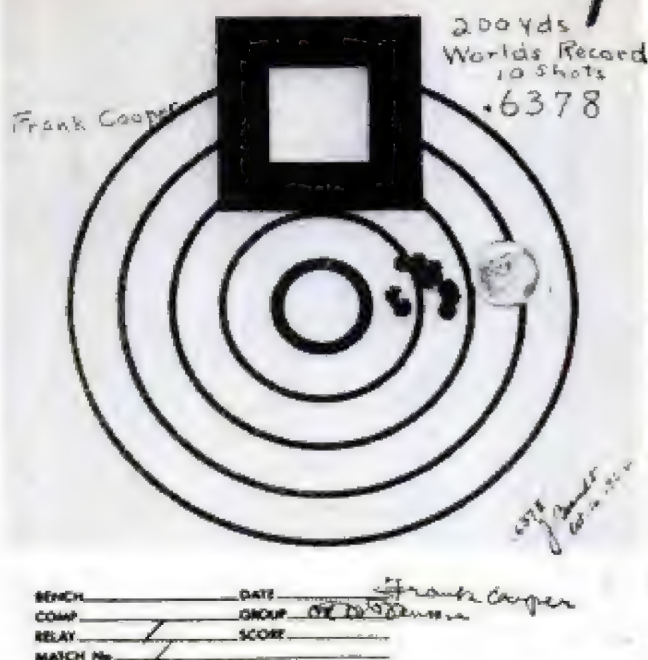
THE L. S. STARRETT COMPANY • ATHOL, MASS., U.S.A.



MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS, BAND SAWS and BAND KNIVES

NATIONAL BENCH REST SHOOTERS ASSOCIATION
OFFICIAL 200 YD.
BENCH REST TARGET

7



World-record .22-caliber group, fired at 200 yards, has 10 holes that can almost be covered with a dime

force of gravity, creating trajectory curve, is minimized. A bullet which flies almost "flat" is the result. The 150-grain Sierra boat-tail bullet, in .270 caliber, rises only five inches above the line of sight when fired at 300 yards, producing a trajectory which is remarkably flat.

It has always been the goal of riflemen to drive bullet after bullet into the same hole. The Sierra designers are constantly striving to produce bullets that will help the rifleman to achieve his goal. ★ ★ ★

Radioactive Magnesium Aids Chlorophyll Study

Probing the secrets of photosynthesis, Dr. Raymond K. Sheline of Florida State University is using a new radioactive isotope of magnesium to discover how magnesium gets into the chlorophyll molecule. Photosynthesis, the process by which sugars and starches are formed from carbon dioxide and water under the influence of light, takes place in the chlorophyll tissues of plants—and chlorophyll has magnesium in its molecule. How the magnesium enters the molecule, since this takes place only in the plant tissues, is a puzzle Sheline hopes to solve through tracer studies with magnesium 28. The isotope, which has a half-life of 21.3 hours, is over 100 times as long-lived as previous magnesium isotopes. Formed in the atomic laboratories of the University of California and the University of Chicago, it is rushed to Doctor Sheline by plane.



Owner goes 'round the world in 40 seconds!

With this new multi-wave portable you can circle the globe in the time it takes to twist a dial.

That's because the RCA Victor Strato-World radio is blessed with Electronic Band Spread Tuning.

Instead of being squeezed together on one-band segment, short-wave stations are in spread formation across the dial of your 7-band Strato-World. You can tune London, Rome, Moscow, Tokyo just as you do the local stations.

See this globe-trotting, pace-setting portable at your RCA Victor dealer's.



RADIO CORPORATION OF AMERICA

World leader in radio—first in television



**RUN AND REMOVE
NUTS EASIER...**

9 TIMES FASTER!

Handles tough nut running jobs easily and fast—even frozen nuts no wrench could budge—in one-tenth the time! Also Drills • Reams • Taps • Drives Screws • Drives and Removes Studs • Wire Brushes • Saws Holes • Drills Masonry • Drives Wood Augers. Standard Attachments handle all operations. 1900 rotary impacts per minute—forward or reverse—do all the work. Motor never stalls... can't burn out.



3 SIZES fit every need... 4U, 8U and 34U (extra heavy duty). Size 4U Impacttool only \$120.00, also available in metal kit with multi-purpose attachments. Sold by all leading automotive jobbers and industrial distributors. Ask for a demonstration or write for catalog.

BBS-18

Ingersoll-Rand
Dept. M-11, 11 Broadway, New York 4, N. Y.

ORIGINATORS OF IMPACTTOOLS—AIR AND ELECTRIC



Automatic Baffle Lessens Heat Loss

Installed in the flue pipe of an oil furnace, an automatic baffle acts as a valve to reduce the amount of heat which goes up the chimney. Suspended from a bracket inside the pipe, it opens wide or closes as pressure and conditions change. The baffle is one of three features of a fuel-saving system for oil furnaces. A second feature is a simplified antipulsating combustion head which will fit the majority of gun-type burners. It produces a turbulating action which increases atomization of the fuel oil for better combustion. A third feature is a powder which is spread on the floor of the combustion chamber. The substance crystallizes from the heat to produce a reflecting surface which is self-cleaning and which reflects heat upward, increasing flame temperature. It glows after the burner shuts off to maintain a warm combustion chamber at all times. Fuel savings of 15 to 40 percent are reported for the system.

Color TV Brings Cancer Lessons To Doctors in Five Cities

Watching four-by-six-foot color-television screens, doctors in five cities are getting one-hour lessons weekly in the detection, diagnosis and treatment of cancer. Arranged by the American Cancer Society, the program is beamed over a closed circuit from New York to medical centers in Boston, Philadelphia, Pittsburgh, Detroit and Toledo. Each of the large screens will accommodate approximately 500 viewers. The weekly series will continue until May.

Ⓛightweight, rustproof aluminum chain is being manufactured for use aboard ships.

Spark Plugs That Perform **LIKE THIS** —

Will Make **YOUR CAR** Perform Better!



Official U. S. Air Force Photo

REFUELING IN FLIGHT, where plane speeds must be synchronized, presents a problem in engine operation that calls for flawless spark plug performance. Spark plugs engineered and manufactured by Champion—a prime supplier to the United States Air Forces—meet this exacting demand.

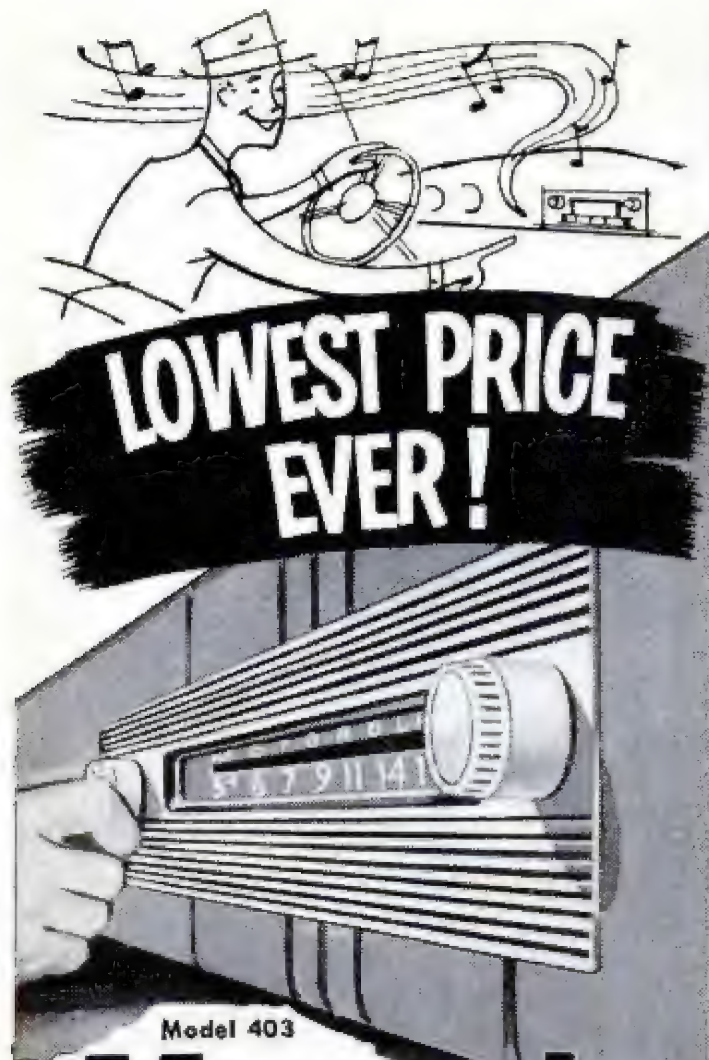
The Champions you purchase for your car are better spark plugs because of such challenges to Champion research, engineering and manufacturing facilities, all of which are devoted exclusively to the production of spark plugs.

So, try Champions in your car—you'll never again be satisfied with ordinary spark plugs.

CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO



*Better by Far for **EVERY CAR** Regardless of Make or Year*



Model 403

Motorola Car Radio

ONLY \$ **39⁹⁵**

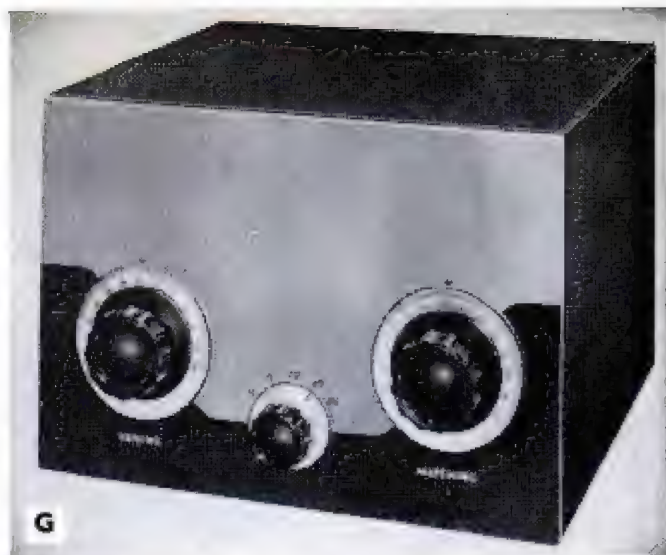
Imagine a powerful, magnificently toned radio like this at such an unbelievably low price! High fidelity, superior tone, extra range and power. Patented motor noise filter, automatic volume control, big speaker and control head adaptable to instrument panel. So easy to install, it can be put in your car while you wait.

Look for this
Sign



Motorola
Authorized Dealer
Car Radio

Better See **Motorola** *Golden Voice of Radio*



Amateur Transmitter Includes Important TVI-Suppression Features

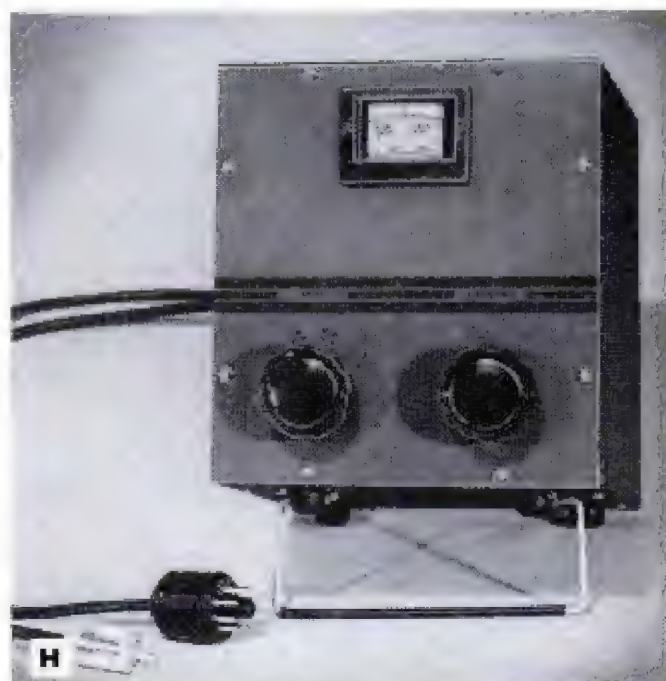
(Continued from page 163)

low-inductance chokes and ceramic-disk capacitors are located at the power line, keying jack, microphone connector and VFO power socket. The antenna relay connector, energized by the "plate" switch is likewise filtered. Coaxial output and VFO-input connectors keep shielding intact. The kit can be assembled by a novice as well as the experienced amateur.

Thoroughly tested on the air by the writer, who is located in a metropolitan area, this kit transmitter was operated in the same room with a table-model television receiver (which employs an indoor antenna) without a trace of interference in the picture or test patterns.

It is an excellent performer on every band from 10 to 160 meters. Output ratings of 100 watts phone and 130 watts CW have

(Continued to page 244)



"PINE PANEL" YOUR WALLS

with Gold Bond Gypsum Wall Planks...the newest in Gypsum Wallboard!

It's an easy, one-man job to put these new lightweight planks right over dull, drab walls. Prefinished Gold Bond *Knotty Pine* and *Bleached Walnut* give you the beauty of fine wood paneling at a fraction of the cost. *Standard* Wall Plank can be painted, textured or wallpapered. See your Gold Bond lumber and building material dealer today!



(2) A special Gold Bond Laminating Adhesive is all that's needed to apply these wall planks. Just mix the adhesive with water, spread on the back of the panels and press into place. No joints to conceal, no nailheads to treat.



(1) Gold Bond Gypsum Wall Planks are only 16" wide, weigh only 16 lbs. in the 8' lengths. They are simpler to cut than wood—just score and snap (above), or saw if you wish. Unlike wood, they are **FIREPROOF!**



(3) Here's how you spread the adhesive on the plank. Your Gold Bond lumber and building material dealer will supply this 3-notch spreader which simply slides along the plank leaving three straight ridges of cement.



(4) Apply first plank at a corner. Press plank firmly against the wall to insure even adhesion, and use a carpenter's level to plumb. Install three planks and re-plumb. Then continue across the wall.

NATIONAL GYPSUM COMPANY • BUFFALO 2, N.Y.

Fireproof Wallboards, Decorative Insulation Boards, Lath, Plaster, Lime, Sheathing, Roofing, Sidings, Wall Paint, Textures, Rock Wool Insulation, Metal Lath and Sound Control Products.

MAIL COUPON TODAY!

NATIONAL GYPSUM COMPANY
Dept. PM-113, Buffalo 2, N. Y.

You'll build or
remodel better with
Gold Bond

Please send me a complete description of this new remodeling system, and complete instructions for applying Gold Bond Gypsum Wall Planks.

Name.....

Address.....

City..... Zone..... State.....

Why Pay More

CRAFTSMAN
REG. U.S. PAT. OFF.

Carbide Tipped Saws

NOW! Save up to \$2.00 during November and December. All sizes reduced until December 31, 1953

\$7.50
8-inch

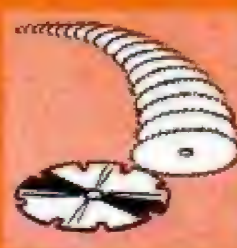
ONE OF THESE SAWS

—a 10-inch blade in actual service—sawed more than 27 miles of 1½-in. laminated Masonite without resharpening, until damaged by a steel object!

=CRAFTSMAN=



Superior blade design provides greater safety. It has only 8 teeth, each projecting .020-in. above non-cutting edge... practically eliminates kickbacks



Amazingly long life! We have testimony proving these blades last more than 20 times longer than ordinary circular saws in actual service

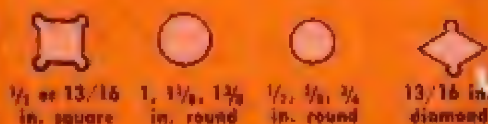
Compare these NEW LOW Sale Prices

Sears introduced this special-design saw less than 2 years ago. Since then it has been so enthusiastically received by circular saw users that our increased production has enabled us to decrease our costs. We want you to share this NEW LOW PRICE!

Tungsten carbide tipped—hardest metal known! Special steel saw blade is heat treated. Teeth are ground with diamond wheels to exacting tolerances to give faster, smoother, more efficient cutting; less vibration; less noise. Needs less resharpening. Rips, cross-cuts, miters. Cuts all woods, plastic, Formica, aluminum, plywood, abrasive building material, wallboard, etc. Not for masonry, steel or other ferrous metals.

Prices reduced at your nearest Sears Retail Store!

Diam.	Arbor Hole	Fits These Saws	Price
5 7/8 in.	13/16 in. diamond	6-in. Skil-saw elec. hand saw...	\$ 6.50
6 in.	1/2 in. square	Mall; DUNLAP elec. hand saw...	6.50
6 in.	5/8 to 1/2 in. round bushed arbor	Porter-Cable electric hand saw; bench saws...	6.50
6 1/8 in.	1 1/8 in. round	6-in. Black and Decker...	6.50
6 1/2 in.	1/2 in. round	CRAFTSMAN 6 1/2-in. electric hand saw; bench saws...	6.50
7 in.	5/8 to 1/2 in. round bushed arbor	Bench saws	7.25
7 in.	13/16 in. diamond	Skil-saw and Sears former 02186 electric hand saw...	7.25
7 in.	1/2 in. square	Mall electric hand saw...	7.25
8 in.	5/8 to 1/2 in. round bushed arbor	CRAFTSMAN 8-in. electric hand saw; bench saws...	7.50
8 in.	13/16 in. square	Mall electric hand saw...	7.50
8 in.	13/16 in. diamond	Skil-saw electric hand saw...	7.50
8 in.	1 3/8 in. round	Black & Decker elec. hand saw...	7.50
10 in.	1 to 3/4-5/8 in. round bushed	Bench, builders', radial, and swing saws...	8.95
12 in.	1 to 3/4 in. round bushed arbor	Radial saws, swing saws, and bench saws	15.50



For Top Quality?

CRAFTSMAN
REG. U.S. PAT. OFF.

Molding Cutter Set

Separate price \$17.45.
You **SAVE** during
November and De-
cember. Set reduced
until Dec. 31, 1953

\$9.95



NEW Plastic Storage Box in-
cluded with each set. Has six
compartments for cutter bits
... compartment for molding
head and accessories



SEARS
ROEBUCK AND CO.

Seventeen different
cutter bit sets avail-
able at Sears Stores

Convert your Bench Saw to a Jointer-Planer and Shaper

- NEW positive-grip safety lock aligns bits accurately, securely; makes it easy to replace bits quickly
- Fits most bench saws with 1/2, 5/8, or 3/4-in. arbors (arbor bushings included with set). Fits most dado inserts
- Made of special analysis steel, balanced for greater safety; scientifically heat treated and tempered

We were selling this outstanding set at the lowest price we've ever heard of. NOW, through a special arrangement with our manufacturer we are able to offer this amazing Molding Cutter Set at a **NEW LOW SALE PRICE**, during the months of November and December. We know of NO comparable set selling at anywhere near this new low price. Sale priced until December 31, 1953. The most versatile attachment we've seen. Saves lumber costs; saves time. Make your own molding, building trim, picture frames, table edges, many other designs.

NUMBER OF DESIGNS ARE UNLIMITED! You are actually limited only by your imagination! Cuts can be planned to overlap, to just meet, to be separated by uncut wood, or to be repeated a number of times. Cutters available at Sears Retail Stores to make tongue and groove flooring, and to cut many other designs.

Cutter bits are made from special heat-treated tool steel; 1-inch wide. Vertical slot in back of blade assures alignment in molding head. Five different cutter bits included (each cutter set has 3 bits) as shown at right. (A) 1-inch planer and jointer . . . use for close tolerance work, drawer parts. (B) Cabinet Door Cutter Bits . . . use for decorative trim on cabinets, tables, etc. (C) Decorative Molding Cutter Bits . . . use to make picture frames, decorative trim. (D) Bead Cutter Bits . . . use for furniture trim, cabinet making, etc. (E) Base Molding Cutter Bits . . . use for building trim, shoe molding, etc.

Set includes cutter head, five sets cutter bits, wrench, space washer, bushings and instructions. In plastic box with slots for six sets of bits. At your nearest Sears Retail Store, at this price until December 31, 1953.



CRAFTSMAN Hand and Power Tools by **SEARS, ROEBUCK and CO.**

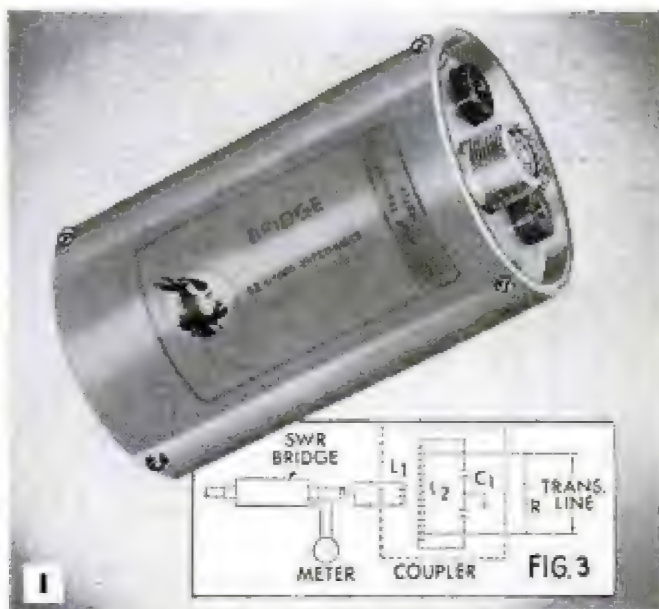
Famous for fine quality . . . precision performance . . . low price!

been established on the 10 meter band. Full excitation to the final amplifier is provided on all frequencies. The block diagram of the transmitter appears in Fig. 1. The line-power consumption is approximately 375 watts when delivering full phone output. It is designed for operation on 115-volt 50/60 cycle a.c. supply only.

The low-pass filter Fig. 2, photo E, is used with this transmitter when extra harmonic attenuation measures are required in TV fringe areas where the TV signals are at an extremely low level. It is installed as close as possible to the transmitter output and the usual antenna-coupler system. Some of the TVI-suppression features such as the low-pass filter, cabinet-bonding fingers (in 3 ft. strips) and similar units are available separately from parts houses for use by amateurs for making TVI-suppression improvements in any ham transmitter.

Another assembled and tested device designed as a companion unit is the completely self-contained and fully shielded, antenna-coupling system shown in photo G. This Matchbox performs all transmission line matching and switching functions, and can be used with any 250-watt transmitter. A built-in change-over relay switches the antenna from the receiver to the transmitter and mutes the receiver

during transmission. A kit-type variable-frequency-oscillator (VFO) companion unit is illustrated in photo H. The VFO is a crystal substitute for those who do not wish to use crystal control; this has excellent stability and is easy to assemble. A useful standing-wave-ratio (SWR) bridge, shown in photo I and Fig. 3, provides accurate measurements and insures the most effective use of the low-pass filter and the antenna coupler for the ultimate in TVI suppression. ★ ★ ★



Scrap pile got you down?



Write today for complete facts and illustrated instructions.

*Reg. U.S. Pat. Off.

HELI-COIL CORPORATION

391 Shelter Rock Lane, Danbury, Conn.

Please send full information on Heli-Coil inserts.

Name _____

Address _____

City _____ State _____



Stripped, damaged or poorly tapped threads—previously considered beyond hope—are now made better-than-new in seconds on the production line with Heli-Coil® Screw

Thread Inserts. These new threads take original size screw, are stronger than before, and last forever in metals, wood, plastics. Fine, too, for quick, economical field repairs.

Needed Heli-Coil tooling practically never wears out, costs as little as \$15 per thread size. Inserts as low as 3c each. Available for all thread sizes including spark-plug and pipe threads.

Never before-a **heating guarantee** like this!

\$1,000.00 Bond backs Coleman Blend-Air!



Complete heating comfort guaranteed with each Blend-Air system installed

What makes this valuable insurance service possible? It's Coleman's exclusive Magic Blenders that give a new, more efficient air blending and circulating process. (See below how the Blenders work.) They mean *no* stale hot air. *No* heat packed at the ceiling with floors freezing cold. Instead, you get continuous, gentle movement of fresh warm air; warm floors; uniform temperature from floor to ceiling.

A completely automatic system with over-all temperature control and *independent* control in each room.

Before installing any system, have your Coleman dealer describe the many new health and comfort features now guaranteed with Blend-Air. Look him up in the Yellow Pages of your telephone book or write us for free literature. The Coleman Company, Inc., Wichita, Kansas.

BLENDED AIR

The Magic Blender does it

In winter, it blends room air with freshly heated furnace air to maintain comfort. In summer, it blends with cool dehumidified air.

Coleman

Blend-Air

OIL
GAS
LP-GAS

CENTRAL HEATING AND AIR CONDITIONING SYSTEM

BLENDING ACTION

1 You're More Comfortable with Blend-Air circulation

3 You Save Space with compact furnace

2 You Save on Installation with easy-to-fit 3½" tubes

4 You're Cool in Summer Add unit any time

ROOM AIR ENTERS

Heaters • Floor Furnaces • Wall Heaters • Water Heaters

The Coleman Company, Inc.
Dept. 702-PM, Wichita 1, Kansas
Please send me free literature on the revolutionary Coleman Comfort Bond.

Name _____

Address _____

City _____ State _____



1

Replace thermostat every year for maximum heater efficiency and better cooling system performance. Quality built original equipment replacement. Rust proof. Easy to install. Either Alcohol type or Permanent Anti-freeze type for all popular cars from.....\$1.47 to \$2.10



2

Enjoy cozy "living - room" warmth. Supreme EA Double-Flow Heater with 7½" dual fan delivers 250 cu. ft. of air per minute. Heavy-duty motor. Illuminated variable speed switch. Original equipment styling. (Defroster kit available.) (21134) \$32.95
Deluxe EA Hot Wave (21132) \$21.95



3

Get better gas mileage, smoother idling, greater power with a fully guaranteed remanufactured carburetor. All parts brand new or fully remanufactured like new. Pressure and flow-meter tested, assuring correct gas and air ratio for top performance. For all popular cars. (Exch.) \$4.75 to \$7.95



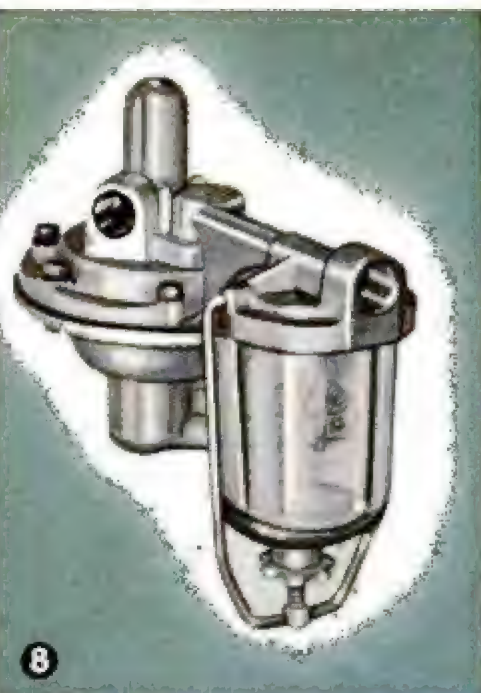
New Power...New Beauty...

Over 40 Years... Headquarters



7

Drednaut Hydraulic Jack takes work and danger out of tire changing. Easy wrist-action lifts any car. Twist—it's down, safely and smoothly. Precision built to meet most severe passenger service requirements. Raises from 7" high to 14¼". Pumping handle included. (A6188) \$11.15



8

Wizard fuel pumps, guaranteed for long, dependable service. Original equipment replacement. Diecast body; precision machined surfaces and parts; fully tested for correct pressure. Diaphragm of extra high quality for longer life, top performance. For all popular cars..... \$2.49 to \$7.95



9

Wizard generators are fully remanufactured to original equipment tolerances and unconditionally guaranteed to equal original equipment performance. New carbon brushes. All parts brand new or fully remanufactured like new. Factory test-run. For all popular cars. From \$7.95(exch.)



Don't be stranded by a worn-out fan belt. Replace now with a Western Auto extra-quality fan belt. Inner core of endless cable cords. Tough rubber cushion reduces heat, assures long life, cooler-running performance. Can't warp, slip, or stretch. Guaranteed fit **65c to \$1.95**



Reduce driving hazards with this turn signal set. Automatically returns to neutral position when turn is completed. Blends with dash and steering wheel. Flashing red indicator light on switch. (21R6176) **\$6.45**
Wiring kit, with all installation material. (21R6177) **\$2.98**



"Minit-On" Tire Chains — so revolutionary you can put them on in just *one* minute. Install anywhere—in snow, on ice, or on a hill. Not "snap-ons", but complete, patented chains with adjusters. Tough, wear-resisting links. Plastic coat sleeve protectors included. Pr. from **\$13.95**

New Safety For Your Car At Western Auto

STORES AND ASSOCIATE STORES

For Top Quality Auto Supplies.

NOTE: Western Auto Associate Dealers own their stores and set their own prices, terms and conditions. Prices may vary due to difference in local conditions. (PM113)



Guaranteed to fire in oil. Aldor spark plugs have bi-metallic thermostat control that keeps spark plug always at peak efficiency for smoother running, easier starting. Adjusts to any heat range requirement automatically. Special non-burning electrodes. Each, in sets . **95c**



Add new beauty and style to your car's interior, and protect your floor mat from excessive wear with these handy rubber utility mats. Also has many uses around the house. Easy to clean. Black, blue, red, or green.
 17" x 17" (2N1105-8) Ea **89c**
 17" x 20" (2N1110-13) Ea **\$1.19**

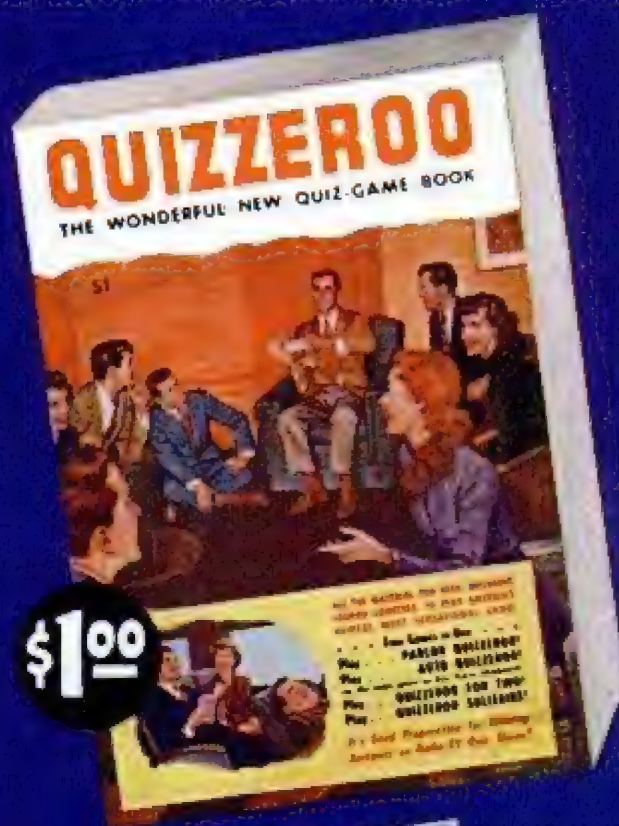


Top quality brake fluid meets S.A.E. standards. Permanent-type, for all cars and trucks. Mixes with any fluid. Perfect all-weather performance—no loss at extremely hot temperatures or freezing at cold temperatures.
 Quart (55555) **\$1.09**
 4 OZS. (55553) **25c**

GET THESE BIG NEW

POPULAR
MECHANICS

BOOKS AT YOUR NEWSSTAND



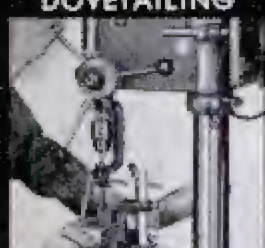
WRITTEN IN THE FAMOUS POPULAR MECHANICS STYLE!

WHAT TO MAKE 1954 offers hundreds of fascinating projects for the home workshop craftsman. There are more than 500 things to make—for pleasure and profit—including a number of exclusive projects such as glassware art objects, a baby bi-plane, toys made from shipping cartons and occasional furniture. **\$1.00**

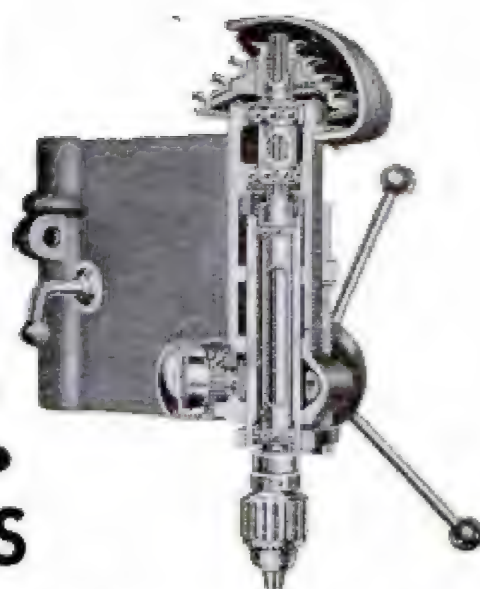
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so much **MORE**
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15" DRILL PRESS



If all drill presses in the price range of the ATLAS Model 1060 were lined up for your inspection, your choice would be easy. On a comparative basis the 15" ATLAS is a standout value. The head is almost twice as heavy, and this, with the balanced overall design, assures maximum accuracy and rigidity. And if you compared performance, the ATLAS would earn your overwhelming preference. Built to strictest industrial standards for actual production use, the 15" ATLAS costs no more than ordinary drill presses. Send coupon or postcard for full information.

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Investigate Before You Invest! Be Sure Your Drill Press Has These Important Features!

1. Biggest, heaviest head with the widest spaced column bearings for maximum accuracy and rigidity. Remember, the head is the heart of the drill press.
2. Table, column, and base are of heavy-duty industrial weight for more accurate work and really s-m-o-o-t-h performance. Balanced design throughout.
3. Exclusive floating drive with six splined spindle and drive sleeve for maximum accuracy.
4. Four widely spaced sealed-for-life ball bearings . . . two on drive sleeve, two on spindle . . . provide greater accuracy, smoother, quieter operation, longer service life.
5. Exclusive neoprene quill stop bumper assures shock-proof return . . . lengthens tool life.
6. Machine ground table may be tilted to any angle, right or left.
7. 41" work capacity over table, 46" over base. Handles bigger jobs.
8. Quick-positioning, direct-reading Vernier depth control stop . . . saves setup time.
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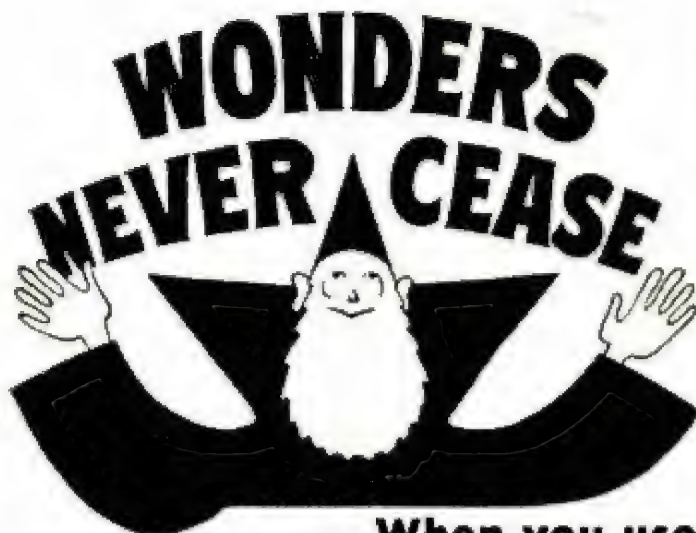
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Send me free leaflets on Weldwood Glue, Firzite and Satinlac.

NAME _____

ADDRESS _____

The Owners Report on the Nash

(Continued from page 106)

"Wheels are very easy to get out of line."
—Oklahoma City, Okla., postal worker.
"Foot brake too close to steering post."
—Athol, Mass., clerk.
"Trunk should have entirely flat floor with tire on the side or else completely set in."
—Fennimore, Wis., bartender.

1953 NASH RAMBLER SPECIFICATIONS

	ENGINE	
	STANDARD	WITH HYDRA-MATIC
Type	6-cyl., in-line, I-head	6-cyl., in-line, O.H.V.
Bore and stroke	3 1/8 x 4 in.	3 1/8 x 4 1/4 in.
Piston displacement	184 cu. in.	195.6 cu. in.
Compression ratio	7.25:1 (7.5 optional)	7.3:1 - 7.5 optional
Brake horsepower	85 at 3800 r.p.m.	90 at 3800 r.p.m.

CAPACITIES	
Oil	4 qt.
Water (with heater)	12 qt.
Gasoline	20 gal.

GENERAL	
Steering ratio, over-all	19.5:1
Steering wheel, lock to lock	3.5 turns
Turning diameter, curb to curb	42 ft. 4 in.
Brakes	conventional hydraulic with riveted linings
Tire size	6.40 x 15
Shipping weight	2475 lb.
Wheelbase	100 in.
Tread, front	53 1/2 in.
Tread, rear	53 in.
Length, over-all	185 1/2 in.
Width, over-all	71 1/2 in.
Height, over-all	59 in.
Road clearance	7 1/4 in.

INTERIOR DIMENSIONS	
Front-seat width	58 in.
Rear-seat width	45 1/4 in.
Headroom, front	36 1/2 in.
Headroom, rear	35 1/2 in.
Legroom, front	34 in.
Legroom, rear	37 1/2 in.

(All Rambler dimensions for two-door sedans; others for four-door sedans)

**1953 NASH MODELS
STATESMAN AND AMBASSADOR SPECIFICATIONS**

	ENGINE	
	STATESMAN	AMBASSADOR
Type	6-cyl., in-line, I-head	6-cyl., in-line, O.H.V.
Bore and stroke	3 1/8 x 4 1/4 in.	3 1/8 x 4 3/8 in.
Piston displacement	195.6 cu. in.	222.6 cu. in.
Compression ratio	7.45:1	7.5:1 (8.0:1 optional)
Brake horsepower	100 at 3800 r.p.m.	120 at 3700 r.p.m. 140 at 4000 r.p.m. optional

Transmission	Conventional 5-speed drive or Dual-Range extra	unit standard. Over-Drive optional
--------------	--	------------------------------------

CAPACITIES	
Oil	4 qt.
Water	15 qt.
Gasoline	20 gal.

GENERAL	
Steering ratio, over-all	24:1
Steering wheel, lock to lock	3.5 turns
Turning diameter, curb to curb	42 ft. 6 in.
Brakes	conventional hydraulic
Tire size	6.70 x 15
Shipping weight	3070 lb.
Wheelbase	114 1/4 in.
Tread, front	55 1/2 in.
Tread, rear	59-1/16 in.
Length, over-all	202 1/4 in.
Width, over-all	78 in.
Height, over-all	61 1/4 in.
Road clearance	7 1/2 in.

INTERIOR DIMENSIONS	
Front-seat width	65 in.
Rear-seat width	64 1/2 in.
Headroom, front	37 1/2 in.
Headroom, rear	36 in.
Legroom, front	41 1/2 in.
Legroom, rear	37 3/4 in.

"Chrome strip below dash reflects into windshield. I painted mine to offset the glare."
—Beardstown, Ill., iron worker.

"Driver's seat should be moved back two or three inches for more legroom."
—Henderson, Tex., oil-field pumper.

Ambassador Comments

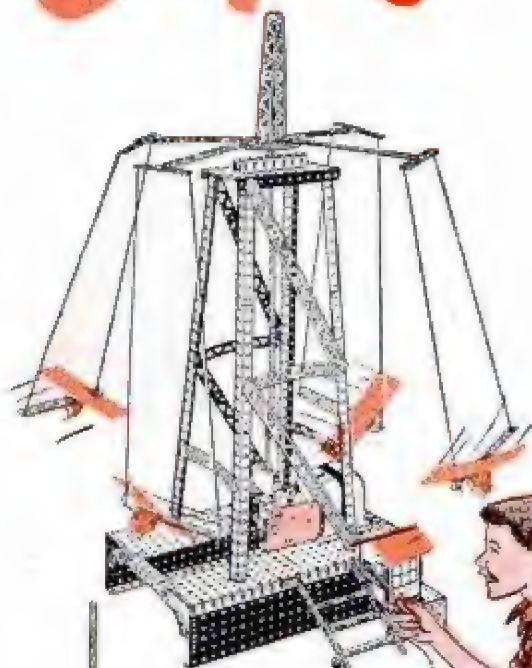
Comfort and riding qualities nosed out economy for top honors with Ambassador owners. Almost half of the owners (45

(Continued to page 252)

BOYS! Get **ERECTOR**[®]

and build hundreds of action models

Put together these gleaming STEEL precision parts and create hundreds of toys! Illustrated "How to Make 'Em" book in every set. But you can do your own inventing! Models whistle, "choo-choo," light up and puff smoke. Tell Dad you want ERECTOR and see displays at stores. For ERECTOR and Gilbert Toy Book (plus American Flyer trains) write Gilbert Hall of Science, Dept. J, Erector Square, New Haven 5, Conn. Enclose 10¢ for handling, postage.



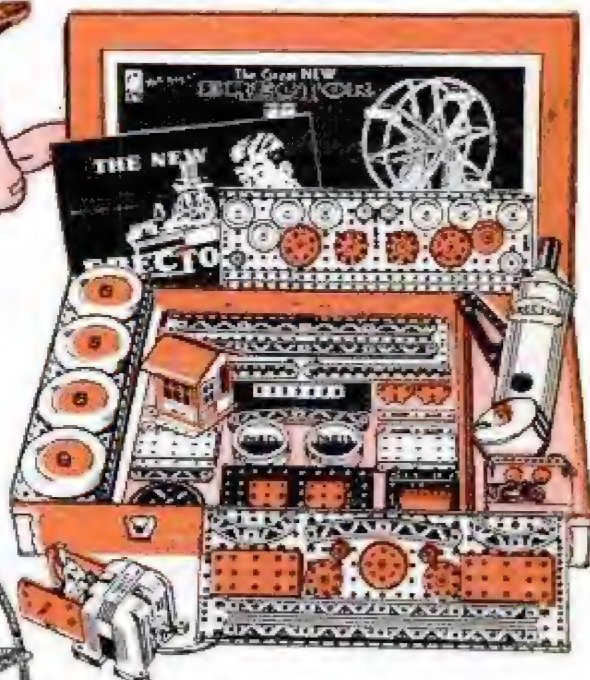
Make this high-swinging airplane ride with ERECTOR No. 6½.

No. 6½ has over 350 parts — sturdy girders, gears, wheels, etc. "Powerhouse" electric engine features many speeds (including reverse) to put action into your models. Builds pile driver, elevator, lift bridge, hundreds of other wonderful toys that work. \$12.95*

Square Girder Construction

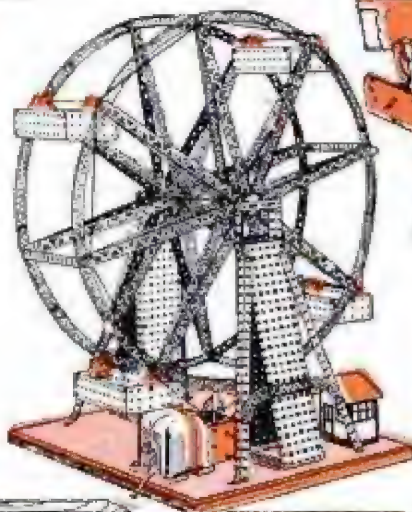
Precision-matched parts easily lock together with nuts and bolts. Can't wobble or warp. Build bridges that hold more than 200 pounds. Parts have lasting gleam.

*ERECTOR prices slightly higher Denver and West



Huge ferris wheel turns fast or slow; reverses. Made with ERECTOR No. 8½.

The all-electric set (No. 8½) has nearly 16 lbs. of parts! Includes 4-speed forward and reverse electric engine, electric lights, electromagnet! Build a mighty crane, oil drilling rig, portable derrick, etc. Heavy gauge steel chest. \$23.50*



WORLD'S MOST FASCINATING
CHRISTMAS GIFT

JR. ENGINEERS
AT WORK
WITH ERECTOR!

ERECTOR
PRICES
START AT
\$2.00*

percent) gave comfort and ride as the qualities liked most.

"Doesn't tire you out on long drives; rides very comfortably."—Freeport, Ill., welder.

"Soft but firm ride; flat ride on curves."—Buffalo, N. Y., lathe operator.

But even the big Ambassador is stingy with fuel, owners say. Forty-one percent listed economy as one of the best characteristics of their cars.

"On a 3339-mile trip I used 149 gallons of gas, traveling 60 to 70 miles per hour."—Hartford, Conn., credit manager.

Handling ease was next in the favor of Ambassador owners (28 percent listing it).

"It is the easiest car to handle on the road that I have ever driven. (I have owned 27 cars of all makes in the past 20 years.)"—Oakland, Calif., clergyman.

"I like best the balance on highway at high speed."—Skokie, Ill., sales manager.

Roominess, visibility and exterior styling were popular with about 22 percent of the Ambassador owners.

"The car has a large passenger compartment and room for a lot of luggage."—Hazel Park, Mich., owner.

"At first the car seemed so wide it made it awkward to park. The longer I drive it the less I notice this wideness."—Decatur, Ill., evangelist.

The Nash bed-in-a-car is popular.

"We love the bed feature. In 1949 we drove our 1948 Nash through 18 states (9450 miles) . . . on the road 52 days . . . slept in the car 45 nights . . . saved \$500."—Battle Creek, Mich., railroad engineer.

As with Statesman owners, the large turn circle was the biggest complaint.

"Cannot turn very short . . . hard to park."—Minneapolis, Minn., carpenter.

Body leaks were complained of by 19 percent of the Ambassador owners.

"Glass gaskets no good—water leaks in."—Birmingham, Mich., engineer.

Another cause of complaint (for 9 percent of the owners) was the doors.

"Door and trunk locks poor. They work hard."—Appleton, Wis., businessman.

"Doors rattle."—Worcester, Mass., school teacher.

And now for my own test: I drove the Farina-styled Nash Rambler hardtop convertible from Los Angeles to Boise, Idaho, via Reno, Nev., and returned through Sun Valley, Idaho, Tonapah, Nev., and across the desert to Los Angeles. Total mileage was 2181 miles.

The Rambler is a short car, but it does have an amazing amount of room for its length. Incidentally, the short 100-inch wheelbase becomes less noticeable the

(Continued to page 256)

NEW!

DO-IT-YOURSELF CARBURETOR CLEANING KIT

Everything* you need to clean your own carburetor right on the engine without taking it apart

*Includes pint of GUMOUT and easy-to-use applicator.



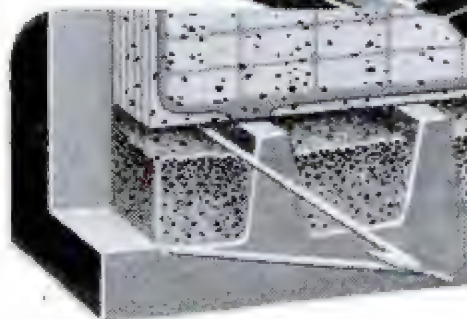
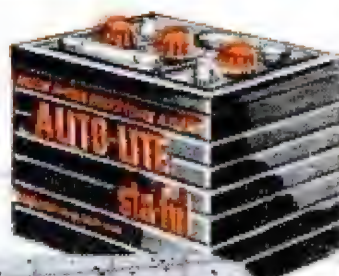
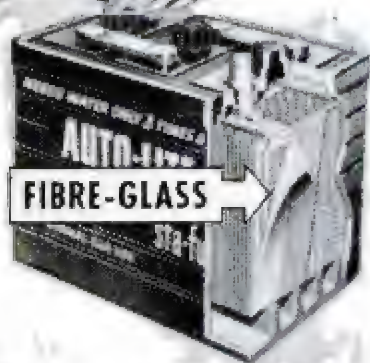
Get better engine performance—smoother idling, faster pick-up, greater gasoline economy. Eliminate engine stalling, bucking, and fuel waste caused by a dirty gummed-up carburetor.

Keep your carburetor clean all the time. *Do it yourself* with GUMOUT and KIT—sold by leading auto supply stores, service stations, car dealers. GUMOUT refills always available from your dealer.

If your local dealer can't supply you, order direct. \$3.95 postpaid.

GUMOUT DIVISION
PENNSYLVANIA REFINING COMPANY
2683 LISBON ROAD, CLEVELAND 4, OHIO

*AUTO-LITE "Sta-ful"
needs water only
3 times a year*.
lasts longer, too
Here's why —*



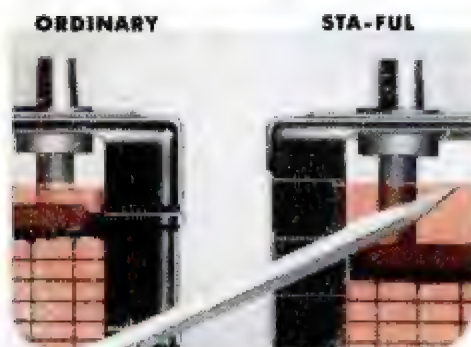
ORDINARY

STA-FUL

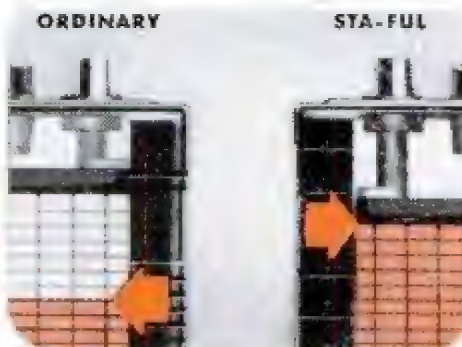
1. Auto-Lite "Sta-ful" has Fibre-glass retaining mats that help keep power-producing material in place to reduce plate shedding and flaking.

2. Because this flaking in ordinary batteries can short circuit plates and cause failures, a deep sediment well is necessary in ordinary batteries to catch flaking waste.

3. Fibre-glass mats, therefore, permit Auto-Lite engineers to lessen sediment-well depth in "Sta-ful," adding extra space above battery plates.



4. This additional reserve over plates gives "Sta-ful" more than 3 times the liquid reserve of ordinary batteries, helps keep plates fully covered and active longer . . .



5. . . as shown by an equal water evaporation test, proving "Sta-ful" gives you greater protection against liquid loss. Make your next battery an Auto-Lite "Sta-ful," the battery that needs water only 3 times a year.*



AUTO-LITE BATTERY CORPORATION

Toledo 1, Ohio

Toronto, Ontario

AUTO-LITE sta-ful

Tune in "SUSPENSE!" . . . CBS Radio
Mondays . . . CBS Television Tuesdays

...needs water only 3 times a year *IN NORMAL CAR USE

PROVE TO YOURSELF WHICH POWER TOOL

How can you do it? Easy—get a demonstration*. Not only of SHOPSMITH, but of other leading makes, too. It's the only



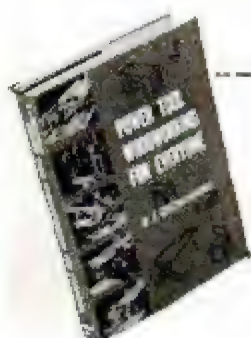
COMPARE CAPACITY Notice that SHOPSMITH's 8" Circular Saw can rip 8' panels into two identical 4' sections. What other saw can do this? And what other drill press can drill to the center of a 15" circle? What other lathe has a 15" swing? What sander has unlimited capacity?



COMPARE ACCURACY Precision is built into every part of every SHOPSMITH. But don't take our word for it—see how the Horizontal Drill Press, for example, dowels large flat pieces *with absolute accuracy*. Notice, too, SHOPSMITH's method for setting the saw blade right to a hairline.



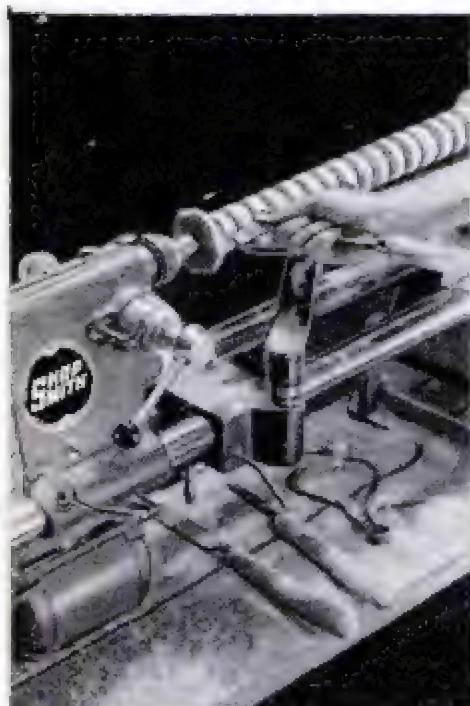
COMPARE VERSATILITY SHOPSMITH is the five most-used big tools in one compact unit—an 8" Circular Saw, a 12" Disc Sander, a 33" Lathe, a Vertical and a Horizontal Drill Press. When you get SHOPSMITH, you get exactly the tool you need for every job you want to do. No special jiggling.



HAVE YOU READ THE NEW MCGRAW-HILL WOODWORKING BOOK? It's the most complete power woodworking book ever published! *Power Tool Woodworking for Everyone* has 283 pages of valuable information and 560 photographs and drawings. Only \$4.95 at book stores and where SHOPSMITH is sold.

IS BEST FOR YOU

fair, convincing way to pick a power tool. Here are a few points to keep in mind when you get your demonstration:



COMPARE EASE OF OPERATION Lathe's sliding headstock puts work within easy reach, allows you to *face* work. Swiveling tool rest slides parallel to piece being turned, eliminates need to reset constantly. Single belt and pulley facilitate speed and tool changes. Makes hard jobs easy.



COMPARE CHANGE-OVER TIME And don't take claims for facts — not even ours. For example, see for yourself how you can change SHOPSMITH from a Saw, Horizontal Drill, Disc Sander or Lathe, into a Vertical Drill Press in less than 60 seconds! Note quick accessory attachments, too.



New Shopsmith 4" Precision Jointer! Extra-long 28" table. Attaches quickly, easily. Can be operated simultaneously with saw as conventional saw-jointer combination. Three-knife cutter head runs on grease-sealed ball bearings. Unique Allen-wrench knife adjustment is easiest method ever devised for jointer knife adjustment. Fence lifts 45°-45°; automatic stops. Width of cut 4"; depth of rabbet, $\frac{3}{4}$ ". Only **\$44.95** (mounting kit, **\$9.95**).

COMPLETE 5-TOOL UNIT

ONLY **\$199.50**

Motor** and bench ends extra

Chrome rust-proofing now standard on all SHOPSMITHS.

Special heavy-duty SHOPSMITH ball-bearing motors: $\frac{1}{2}$ h.p., **\$34.50; $\frac{3}{4}$ h.p., **\$44.50**

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MAGNA ENGINEERING CORPORATION, Dept. 255-B at factory nearest you:
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Please send me a free copy of the latest SHOPSMITH 16-page booklet.

Name _____

Address _____

City _____ State _____

longer you drive. I'm long legged and I was cramped on only one stretch when we covered 500 miles in less than nine hours. Cushions and back-seat springing are above average. The ride was surprisingly satisfactory. Suspension is especially good, and the car, due to its short wheelbase, handles far above average on short turns or mountain curves. You can "scat" in and out of corners unbelievably fast.

Acceleration, power on the hills and top speed were excellent. On long open stretches in overdrive the speedometer hit from 91 to 93 miles per hour. It will cruise at 80 to 85 miles per hour. The car handled well at high speeds even in strong winds, which we had most of the time returning through Idaho and Nevada. The "Flying Scot" 184 cubic-inch, 85 horsepower engine of L-head design has a bore and stroke of 3 1/8 by 4 inches and a 7.25:1 compression ratio. (Rambler Hydra-Matic models have 195.6 cubic inch displacement, 90 horsepower and 7.3:1 compression ratio—7.5:1 head is optional—and the stroke is increased to 4 1/4 inches. See specification table. I found regular gas satisfactory, as did 63 percent of the owners answering our poll. Nash has a large (20 gallon) gas tank. This is an excellent feature, especially with the Rambler, as unbelievable distances can be covered between refuelings.

All Nash cars have an unusual suspension. The coil springs are extra long and the "sea leg" shock absorbers aid in increasing front-end stability on curves and riding comfort. The coil springs bear directly against the kingpins and the lighter control arms permit less unsprung weight, which is good. The conventional heavy front cross member is eliminated in Nash design. The large armrest interferes somewhat with the window-crank movement. The armrests are the same as used in the larger Nash models. They appear large in the Rambler and would be more comfortable if mounted lower on the door. The wide doors open easily by pinch-type locks. They could close easier and fit better.

All instruments are neatly housed in one shrouded glass, directly in front of the driver. I'm happy to say that the unnecessary upper half of the horn ring does not interfere with speedometer or instrument vision. Lights for oil and ammeter warnings are used. I like indicating needles better.

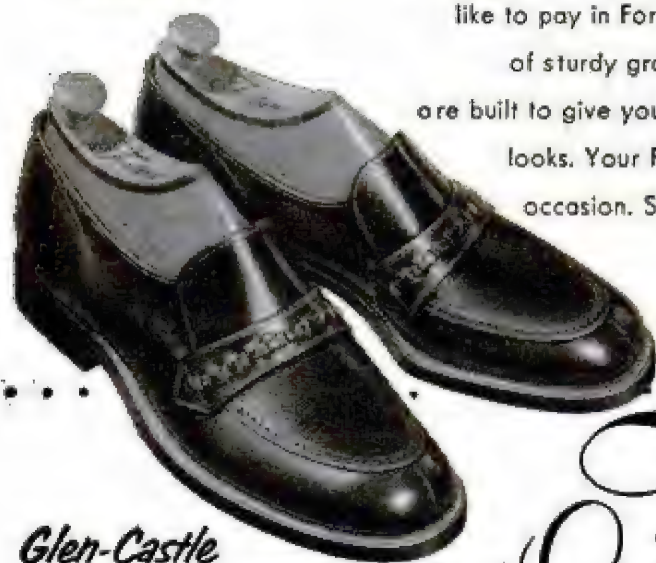
The glove compartment has considerable room and is a pull-out drawer. Improvements should be made in the operation of the drawer. Twice it fell off the rails when pulled out too far.

The Rambler hood has a slot in front which admits fresh air to the engine—a

(Continued to page 258)

Save money... step into a Fortune!

STYLE 6016



Glen-Castle

GRAINS

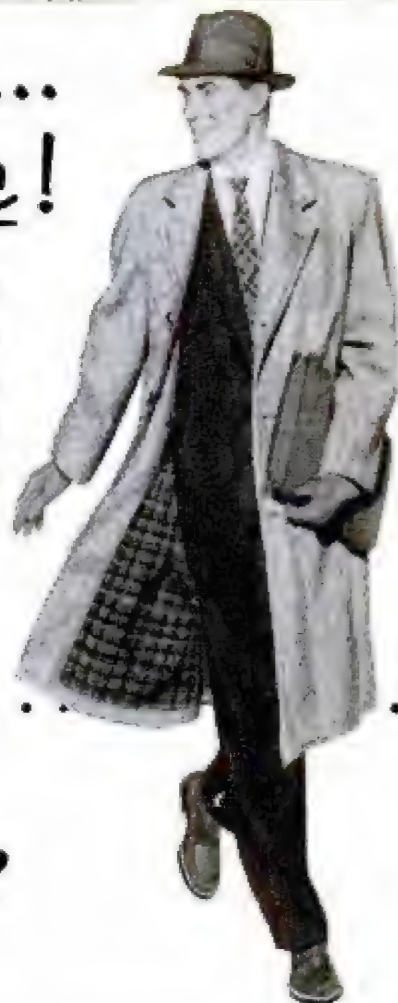
sturdy styles in
grain leathers
for rugged wear

- You get America's top styling at the popular price you like to pay in Fortune's "Glen Castle" grains. Made of sturdy grain leathers, these handsome shoes are built to give you rugged wear, comfort, and good looks. Your Fortune dealer has styles for every occasion. Save money... step into a Fortune.

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RICHLAND-DAVIDSON SHOE COMPANY • A DIVISION OF  GENERAL SHOE CORP. • NASHVILLE, TENNESSEE



Number Two of a Series

What every Automobile man should know about **Power Steering**

POWER STEERING is attracting more attention in the automotive field, and winning more rapid public acceptance, than anything since automatic transmission. Saginaw Power Steering is now available on all General Motors cars and three other well-known makes. Already over *half a million* new-car owners are enjoying it—yet, as with any new product, there are still some misconceptions due to incomplete or faulty information. That's why we, as the world's largest producer of power and manual steering gears, are publishing this series of messages to help answer some of the questions most frequently asked about Power Steering.

4. WHY IS "FEEL OF THE ROAD" SO IMPORTANT TO POWER STEERING SAFETY? Without



This simplified graph shows the basic difference between Saginaw Power Steering and ordinary types. The latter apply power at the slightest touch of the wheel, tending to cause overcontrol. Saginaw Power Steering goes into action only when more than "fingertip" pull is needed. This SAFETY ZONE is purposely provided to assure normal "feel of the road" and prevent oversteering.

this familiar "feel" in the steering wheel, many drivers have a sense of insecurity and a tendency to oversteer. In other words, *when power is applied continuously, steering is frequently too easy for safety.* So we have deliberately designed Saginaw Power Steering to go to work *only when you need it.* Whenever mere "fingertip" effort is needed to steer (as at high speeds on a smooth, straight highway) your car remains under conventional manual control. But, the moment *more than "fingertip" effort* is called for, Saginaw Power Steering instantly supplies the additional "muscle"—with just enough effort left to the driver to assure the normal "feel of the road"—as graphically shown in the chart. With Saginaw Power Steering there is never any sensation of "driving on ice." *It never interferes with safe control of your car.*

5. MUST DRIVERS BECOME ACCUSTOMED TO POWER STEERING? Not Saginaw Power Steering!

There's nothing new to learn because your wheel still has that reassuring "feel of the road" at all times. *You cannot feel Saginaw Power Steering "cut in" or "cut out."* The only difference you notice is the effortless ease of turning . . . the wonderful freedom from "wheel fight." After a turn, your car straightens out exactly as with manual steering.

The simple, ingenious Saginaw design which accomplishes all this so dependably will be the subject of our next message.

MEANWHILE—If you'd like to learn more, we'll be delighted to send you "THE FACTS ABOUT POWER STEERING"—an interesting booklet we've prepared to help give you a better understanding of this important new development. It's yours for the asking—just use the handy coupon.

Saginaw

POWER STEERING

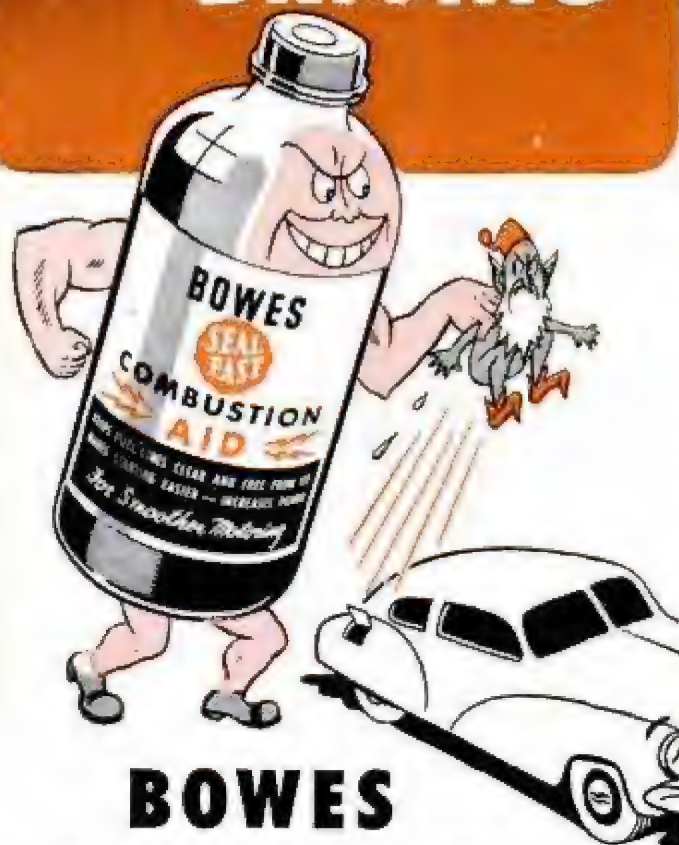
Saginaw Steering Gear Division
General Motors Corporation
Saginaw, Michigan (Dept. M)

Please send a free copy of "The Facts About Power Steering."

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FOR SMOO-OO-THER WINTER DRIVING



BOWES COMBUSTION AID

**KEEPS JACK FROST
OUT OF YOUR GAS TANK,
MAKES STARTING EASIER,
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Be sure of quick, easy starting this winter! BOWES Combustion Aid absorbs the water in your fuel lines, keeps them free of gums and rust, softens and removes carbon. Easy to use . . . just put it in your gas tank . . . and have dependable, inexpensive cold weather protection! Your Bowes "Seal Fast" dealer can supply you.

**DRIVE IN
WHERE YOU
SEE THIS EMBLEM**



BOWES "SEAL FAST" CORP., INDIANAPOLIS 7, INDIANA

good idea. Due to the sloping front hood, vision directly in front of the wheels is excellent. The Rambler is a safe car because of the protection furnished by the unique Nash construction—body and chassis are welded together and are not two separate units as in conventional cars. This construction undoubtedly helps to decrease rattles and squeaks and adds to safety in event of an accident. During the long hard test I made in the Rambler there was slight seepage of water during a moderate rain because of one poor-fitting door.

The brakes operate with slight pedal pressure and for normal driving are entirely satisfactory but there was some fading at high speeds and on winding roads. The Rambler brakes (and also the Statesman) are of the simple but dependable two-shoe design. Hydra-Matic Ramblers have a larger front brake drum to compensate for additional weight. In the larger and heavier Ambassador models the Duo-Servo system is used (where the two brake shoes are hooked together), thereby multiplying the braking effort by the brake pedal.

The spare tire is mounted outside the trunk, giving the car a somewhat sporty appearance. Through a lever arrangement, the tire quickly tilts backward on a hinge mount so it does not interfere with trunklid operation. In this hardtop model there is considerable space in the trunk for a 100-inch wheelbase car. Due to the tire location, the rear bumper extends a few inches farther. This overhang I found caused some scraping of the rear bumper, exhaust pipe or both in entering or coming out of driveways with sharp inclines.

I did not like the large turning radius, caused by the narrow front tread and the skirted front wheels.

Many drivers feel there is much road wander and bouncing about in a light car. This idea will be soon dispelled for anyone driving the Rambler 200 miles. ★ ★ ★

Sedative Calms Fish

Sodium amytal, a sedative and hypnotic used to quiet patients before surgery, is soothing fish en route from state hatcheries to lakes and streams in California. Because the calmed fish use less oxygen, 500 instead of 200 fingerlings can be transported in a gallon of water to which has been added a half-grain of the barbiturate. As soon as the fish are dropped into fresh water they throw off the drug and swim away unharmed, in better condition than if the drug had not been used. Fewer trips by tank trucks and airplanes result in savings to the hatcheries.

NEW

DREMEL

STRAIGHT-LINE ACTION

SANDER

JUST IN TIME FOR CHRISTMAS GIVING!



PAT.
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HAS A POWERFUL
ROTARY MOTOR!



Complete with: two
sanding pads, and 6
assorted abrasives.
Extra pads \$2.75
each.

\$34.85

**A PROFESSIONAL SANDER
AT A HANDYMAN'S PRICE**

Here's a heavy-duty sander built for the industrial woodworker and professional craftsman, and priced for the home handyman! The new Dremel "53" Straight-Line Action Sander weighs only 5 1/4 lbs., is driven by a powerful rotary motor (110 V. 60 cycle AC) . . . 6,900 strokes per minute . . . has no gears, belts, brushes or commutator to wear out and replace. Dremel Straight-Line Action guarantees satin-smooth finishes you'll be proud to show. Detachable paper holder speeds up paper changes. Use it for WET or DRY, coarse, medium or fine sanding . . . the Dremel "53" is positively the most versatile . . . the greatest sander value in today's market.

THERE'S A DREMEL SANDER FOR EVERY USE



**LIFETIME
SEALED
BALL BEARINGS**

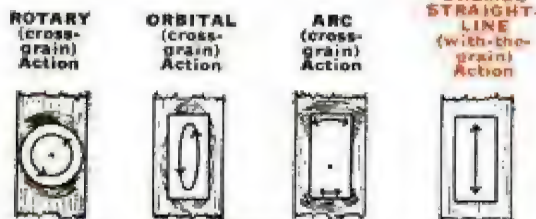
**EASY ON!
EASY OFF!**

Unique paper holder is detachable. Grits can be switched quickly without bothersome paper change.

25 sq. in. (3 3/4" x 7") sanding surface!

**Here's Why Craftsmen Approve... Use...
Only Straight-Line Action Sanding!**

Wood fibers lie with-the-grain . . . are directional. Sanding cross-grain is much like brushing a suede jacket against the nap. It leaves marks or "scratches." Sanding with-the-grain is like brushing the suede with the nap . . . leaving a velvet-smooth surface, entirely scratch-free. Shown below are four common types of sanding actions. Only Dremel "Straight-Line Action" sands 100% with the grain . . . Only Dremel can guarantee 100% scratch-free finishes.



SEE YOUR FAVORITE DEALER: Dremel Tools are sold at better dealers everywhere. If your dealer can't supply, order direct on a five-day trial, money-back guarantee. Remit in full, and we will ship postpaid. Or, send only \$2.00 now, pay postman balance plus postage and C.O.D. fee.



**DREMEL MODEL "2000"
SANDER-POLISHER**

Perfect for small shop use, home repair, and workshop projects. Choice of craftsmen for fine finishing operations. Features Dremel "Straight-Line Action": 14,400 strokes per min.; 5 lb. wt.; 21 sq. in. (13 1/4" x 7") sanding surface. Model "2000" Sander-Polisher, 25 asst'd. abrasives, 1 polish pad, in sturdy steel carrying case..

\$24.50

**DREMEL MODEL "A"
SANDER-POLISHER-
MASSAGER**

Lighter capacity model, a favorite for general home maintenance, hobbycraft, furniture polishing, etc. Effective body massager. Features Dremel "Straight-Line Action." Wt. 2 1/2 lbs.; 12 sq. in. (2 3/4" x 5 1/4") sanding surface. Model "A" Sander-Polisher-Massager, 6 abrasives, 1 polish pad, 1 massage pad.

\$14.85

DREMEL MANUFACTURING COMPANY, Dept. 113-L, Racine, Wisconsin



make your **HANDS** **MORE CREATIVE** with **x-acto Knives and Tools**

Creative hands can be your greatest asset... X-acto knives and tools help the intelligent coordination of active minds and agile fingers... they can develop skill and dexterity in any art or handicraft you select.



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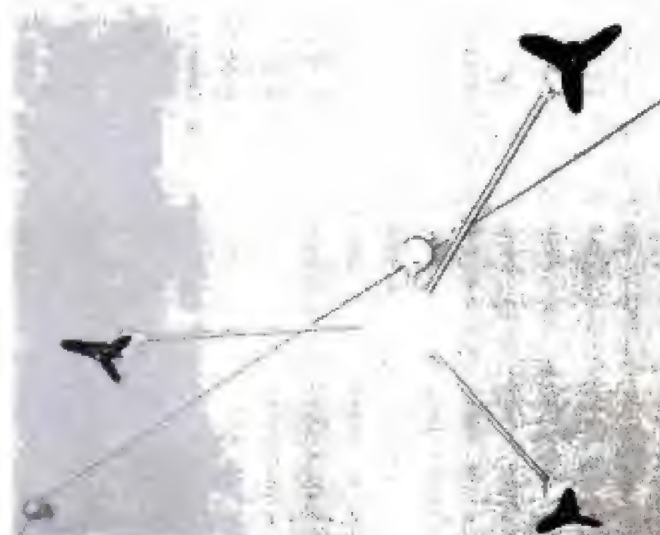


Paint-Can Holder

Painting from a ladder is simplified by a fixture which holds a gallon paint can against the side of the ladder. The device rests on the frame, supported by an interior fastener which hooks to the rung. Two hooks on the outside grip the can firmly by the rim. The device may be used on either side of the ladder.

Ceiling Fan

Good air circulation is claimed for a device of novel design. Three tiny fans suspended from the arms of a ceiling fixture rotate the hanger as they ventilate the room. The appliance, manufactured in Germany, is silent and is said to provide comfortable cooling.



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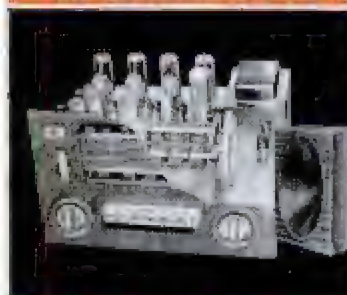


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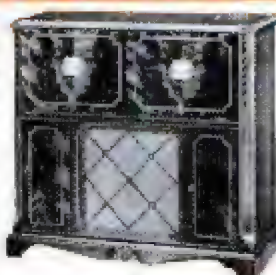


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Once again Midwest offers its famous series 16 five band AM-FM radio chassis and the magnificent new Symphony Grand Radio-Phonograph with 3-Speed Automatic Inter-mix Record Player. Also, a complete line of clock radios, table radios, and portables.



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MIDWEST RADIO & TELEVISION CORP.

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Prospectors in Parkas Chart Canada's Oil

(Continued from page 119)

priming coat would be followed by a coat of coal-tar enamel applied at a temperature of around 475 degrees F. Then would come a layer of glass-fiber matting and, on top of that, asbestos felt. In rock cuts, an extra layer of the felt, known as rock shield, could be applied.

It's unlikely that any company would want to lay such a costly line without an assured supply of at least 10,000 barrels a day, which would mean proved reserves of about 100,000,000 barrels. It would probably want assurance of well over 10,000 barrels a day even to start, and might want to plan on an ultimate movement of as much as 200,000 barrels daily. The quantity would determine the diameter of the line—probably between 18 and 24 inches—as well as the pumping capacity.

Now the \$64 question: the characteristics of the oil. Crude with a low viscosity and a low pour point is what oilmen hope to find there, since this kind is the easiest to move. The higher the viscosity and the pour point, the more heat will be required to keep the oil liquid enough to flow. The proportion of sulphur, asphalt and wax is also important. A high proportion of these would also increase heating requirements and would, at the same time, reduce the crude's usefulness at the pump stations. If the crude is relatively free of these, and if it has other good characteristics, the pump stations can be self-fueling. They can simply tap off their own fuel from the oil flowing through the line. They could thus be unattended—what oilmen call "satellite stations."

Once oilmen find just how much oil, with what characteristics, they have to move, they can plan a pipe line. In their words, "Nothing is impossible in this business. It's just a question of how much you're willing and able to spend, of how much something is worth to you." They say that if necessary they can build generator stations all along the line and heat the oil by electricity. Heat could be applied not only at pump stations, but also at separate installations between pump stations. More powerful pump stations, closer together, can be used to cross mountains. As for the geographical distance between stations, pipe liners fall back on their constant refrain: "It all depends on the situation. How much oil, what kind of oil, over what terrain? Maybe a station every 10 miles, maybe every 100 miles."

(Continued to page 264)



Quit driving an oil-burner— get new piston rings!

Oil pumping is just the start of expense and trouble—the first danger signal from worn-out piston rings. The longer you let those old rings stay in, the more oil you'll use, the more power you'll lose, and the bigger your repair bill will be!

As your engine gets older, it runs hotter because of accumulations in the cooling system. The cylinders wear tapered and out-of-round—need more oil on the walls.

It requires a special type of piston rings—replacement rings—to deliver this extra oil, under full control, without waste.

Hastings makes replacement rings exclusively, devotes all its research on the highways and in the laboratory, to the particular replacement problems of each make and type of engine.

That's why Hastings Rings *stop* oil-pumping, *check* cylinder wear, *restore* engine performance—in re-ring, re-bore and re-sleeve installations.

So go to your motor specialist at the first sign of oil-pumping or performance drop-off. If rings are the trouble, ask him to install a Hastings Steel-Vent replacement set. Truly the best money you can spend on your car! Hastings Manufacturing Company, Hastings, Michigan; Hastings Ltd., Toronto; Piston Rings, Spark Plugs, Oil Filters, Casite, Drout.

HASTINGS STEEL-VENT PISTON RINGS

Regular or Chrome

**Tough on Oil-Pumping
Gentle on Cylinder walls**



EXTRA QUALITY...especially for you

If you own a Plymouth, Dodge, De Soto,
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Chrysler Corporation believes in "taking care of its own". It provides the best possible parts for owners of its cars and trucks. These are MoPAR parts—your assurance of the *extra quality* that comes from the very finest of materials, the most skillful design, the most careful manufacture and inspection.

So let the MoPAR sign be your guide to thorough satisfaction—with parts that fit right and work right. Look for this sign, displayed by thousands of Plymouth, Dodge, De Soto and Chrysler dealers and many general service and repair shops.

Chrysler Corporation
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Detroit 31, Michigan

How to get more mileage out of your motoring dollar



SHIFT WITH CARE

Use low and second gears carefully when starting. It's the mark of a good driver to shift at low speeds —

thus avoiding excessive engine wear and gas consumption. Experts agree the most economical shifting speeds are: low to 2nd—about 5 mph; 2nd to 3rd—between 10 and 15 mph

Wash with a mild detergent or auto soap. Strong cleansers quickly wash away protective wax coatings . . . may wear paint. After a good wax job, water alone should get the car clean. Later, a little mild soap or detergent may help. Frequent washing keeps gritty dirt from working into and damaging the finish.



NEVER USE STRONG SOAP



FINEST OIL FILTER

Keep a clean oil filter on the job. Your oil filter traps engine-wrecking abrasives and sludge out of engine oil. In time, however, any filter loads up—gets so clogged it can't filter anymore. Before that happens, put in a new Purolator Micronic* Refill. Accordion-pleated,

plastic-impregnated element has up to 10 times more capacity than ordinary filters . . . stops dirt you can't even see. There's a Purolator* engineered for every make of car and truck. Refills cost as little as \$1.60. Takes just a few minutes to install.

*Reg. U. S. Pat. Off.

Check your oil filter every time you change your oil

PurOlator
World's finest OIL FILTER



The experience of the Trans Mountain pipe line, now under construction from Edmonton to Vancouver, offers some clues to what might be required farther north. This line is in relatively "easy" terrain, but construction is so tough that it's already being called the "Inch-by-Inch" and the "Robert Ripley" line. This line expects to get by with only five pump and booster stations along its 711-mile length, but the total cost of the line will crowd \$100,000,000, and about \$5,000,000 worth of crude will be required just to fill it. This 24-inch line is being built for an ultimate movement of 200,000 barrels of crude a day.

On the exploration job, there's nowhere to go and nothing much to do except work, so the men put in long hours, seven days a week, for long stretches. They also save money, since there's no place to spend it. When, as they say, they're "bushed," they're flown into civilization—which may be anywhere from New Orleans to Montreal—where they relax and kick up their heels until they're ready to go back into the bush for another hitch. Since recreations are few, reading, playing cards and listening to records constitute the main amusements. All seismic camps are equipped with two-way radio systems, but these have to be kept free for urgent communications.

It's a hard, lonely life but it may mean fuel in the gas tank of your automobile a few years hence. ★ ★ ★

Antirust Fluid in Oil Tank Stops Leaks for Three Years

Leaks caused by corrosion in fuel-oil tanks are prevented by a new crystalline substance developed by the Shell Oil Company. Experiments indicate the corrosion results from water created by moisture condensing within tanks from the humid air breathed in through the vents. Being heavier than oil, the water sinks to the bottom and lies in small droplets. A tiny electric current is set up through the water, eating away the steel and converting it to rust. It deepens into a pit, then eats through to cause a leak. The new substance, called Sonitor, sinks to the bottom and mixes with the water. It stops the electric current that attacks the metal, as well as reacting with the metal to form a protective coating on it. The contents of one small can are sufficient for three years of protection.

¶ In 1952, according to the U. S. Department of Agriculture, there were 4,170,000 tractors on American farms, compared with 1,545,000 in 1940.

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D.C. GENERATORS

ITEM #91 Type R-1, rated 300 Amps.—30 Volts. Mfd. by Jack & Heintz, Gov't. Acq. Cost \$380.00. Shpg. wt. 55 lbs. Dimensions 16" x 10" x 7". F.O.B. Chicago. **35.00**

Item #176—Type L-3, Rated 25 amps., 24 volts. Manufactured by Leeco-Neville Co. Shpg. wt. 30 lbs. Dimensions 12" x 8 1/2" x 5 1/2". F. O. B. Chicago. **16.50**

Item #90—Type P-1, rated 200 Amps.—24 Volts, 2500 RPM. Mfd. by General Electric, Ford, Delco-Remy and Westinghouse. Gov't. Acq. Cost \$300.00. Shpg. wt. 55 lbs. Dimensions 15" x 9" x 8". F.O.B. Chicago. **22.50**

BRAND NEW — BERRY — HEAVY DUTY HYDRAULIC PUMP OR MOTOR

ITEM #166 — use on farm equipment, road machinery, vibrators, paper mills, wire reels, hydraulic brakes. Ball bearing construction, balanced cam design assures high efficiency performance. When used as a pump: delivers 11 G.P.M. 1000 P.S.I. 8 H.P. At 1800 R.P.M. as a HYDRAULIC MOTOR: Rated up to 12 H.P., up to 2400 R.P.M. Standard 3/4" pipe thread ports, 3/4" shaft with keyway. Dimensions: 14 1/2" x 8" x 7". Weight 63 lbs. Regular price today \$212.00. Our money saving price F.O.B. Chicago. **110.00**

Item #150—Double acting hydraulic cylinder, 2 3/4" bore, 12" stroke. Use either foot or clevis mounting. Will lift 4400 lbs. using 1000 P.S.I. Overall length 19 1/2". Shpg. wt. 18 lbs. Postpaid, **18.00**

QUICK DISCONNECT HYDRAULIC HOSE COUPLER — Item #309 — Self sealing, for uncoupling oil lines under pressure. Made by the Brunning Company. Each end threaded for 1/2" pipe connection. Rugged three piece precision steel construction. 4" long, 1 1/2" dia. Shpg. Wt. 2 lbs. Regular price \$12.50. Special price **5.75**

GENERATORS



ITEM #183 3 wire. Panel contains oil gauge, voltmeter, ammeter, circuit breaker, voltage regulator, start button. Today's cost over \$1200.00. SALE PRICE, F.O.B. Chicago. **465.00**

MANY SIZES FROM 350 WATTS TO 25 KVA

ITEM #183—Power for your home or business. Simply connect to power panel or house circuit. • Constant voltage regardless of load. • Push button start or stop. • Easily made full automatic start or stop. **SPECIFICATIONS** — Size: 19"x30"x48". Steel skids, weatherproof housing. Requires no building. Wt. 725 lbs. • Hercules 4-cyl. 10 HP gasoline engine. Load governor. Oil filter. Quiet muffler. 6-volt starter, generator. • Hobart 115 volt, 60 cycle, 3000 to 4000-watt generator. Furnishes either single or three-phase power, 2 or 3 wire. • Panel contains oil gauge, voltmeter, ammeter, circuit breaker, voltage regulator, start button. Today's cost over \$1200.00. SALE PRICE, F.O.B. Chicago. **465.00**

GOV'T. SURPLUS! JUST RELEASED!

2-TON, 6-WHEEL HYDRAULIC LIFT TRAILERS

USE FOR: Conveyor ramp • Boat trailer • Lumber • Pipe • Pole trailer • Machinery trailer • Hydraulic dump for grain wagon • Coal truck • Lift truck • Variable height hydraulic work table • Removable rack permits use of hydraulic lift for other installations.

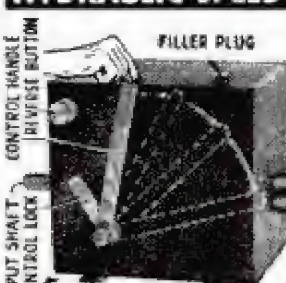
Outstanding features of these Trailers are:—4000 lbs. payload. 2 individual hydraulic lifts complete with hand pumps and valves. 6-1/2" x 5.5 pneumatic tires. Manual screw-down brakes. Ball-bearing axles, V-shape load rack—8' long. Towing tongue, 54" lift. Wheelbase 98". Ground clearance 4 1/2". Tread width—52". Overall width—58". Overall length including drawbar—167". Gov't. cost \$685.00. Shpg. wt. 1400 lbs. F.O.B. Chicago. **169.50**

Use the adjustable height load rack for boats, lumber, poles or pipe. By adding a plate, you have a ramp adjustable to freight car or truck body-height. Add a grain wagon body to the frame for a perfect self-contained hydraulic dump wagon. Mount work-in-process on trailers, permitting adjustment of work height for maximum efficiency. Easy launching and recovery of boats from sloping beaches is done by hydraulically raising and lowering either end of load rack.

HEAVY DUTY HYDRAULIC and AIR EQUIPMENT

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient smooth pressure hydraulics on presses, arbors, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc. ALL ITEMS BRAND NEW.

HYDRAULIC SPEED REDUCER



ITEM #115 hydraulic motor. Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Shafts measure 5/8" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speed not to exceed 750 R.P.M. Over-all dimensions, 7 1/2" x 7 1/2" x 11 1/2". Gov't acquisition cost \$428.00. Shpg. wt. 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago. **54.50**

WITH FINGER TIP CONTROL

USE FOR: • Reamer Drives • Midget Cars • Feed Mills • Canning Machines • Conveyors • Lathes • Milling Machines • Motor Boats • Cream Separators • Garden Tractors • Pumps

Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of 1/4 to 1 1/2 H.P. This Westinghouse-Oil Gear Unit consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Shafts measure 5/8" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speed not to exceed 750 R.P.M. Over-all dimensions, 7 1/2" x 7 1/2" x 11 1/2". Gov't acquisition cost \$428.00. Shpg. wt. 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago. **54.50**

ELECTRIC GENERATOR SET—MODEL 2510

2500 watts, 115 volts, 60 cycles, single phase, A.C. electric generating plant, powered by dependable 6.5 H. P. Wisconsin engine—Two pole ball bearing belt driven high efficiency generator with heavy duty windings for high torque motor starting loads. Rated 3000 watts for intermittent service. Light weight portable rugged unit, easily transported to job site. Consumes 3 quarts of gas per hour at rated load. Dimensions: 24"x20"x24", ship, wt. 220 lbs. Complete with fused outlet box and voltmeter. F.O.B. CHICAGO. **329.00**



Item #178—350 Watt—110 Volt—60 Cycle A.C. Model MS-35-3, made by Midea Mfg. Co. 1 cylinder, 4 cycle engine complete with muffler, starting rope and oil bath air cleaner, direct coupled to a 350 watt generator with voltage control rheostat and twin outlets. Engine speed 1800 R.P.M. Shipping weight 116 lbs. F.O.B. Chicago. **89.00**



Item #126—Four-way, open center control valve with built-in adjustable relief valve. Factory set at 1000 P.S.I., spring loaded neutral position, for use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Fully balanced plunger type smooth, positive, easy operation. Can be used as single unit or mounted in series of any combinations desired. Has 3/4" pipe thread inlet and outlet, 1/2" pipe thread cylinder ends. Newly manufactured to our specifications. Ship, wt. 8 1/4 lbs. An outstanding buy! F.O.B. Chicago. **21.50**



Item #1036—Double acting hydraulic cylinder, 3" bore, 36" stroke, 1/2" pipe thread ports, 1 1/4" solid steel shaft. Overall length closed 49". Clevis mounting at base and shaft. FEATURES: Cup & Chevron Packing • All Welded Construction • Precision Ground and Honed Construction • Will lift 7000 lbs. using 1000 P.S.I. line pressure. Wt. (net) 57 1/2 lbs. F.O.B. Chicago. **50.00**

Item #16C—Double acting hydraulic cylinder, 1 1/2" bore, 20" stroke. Will lift 1760 lbs. with 1000 P.S.I. line pressure. Weight 8 lbs. A \$55.00 value. Now only Postpaid **16.95**

Brand New CENTRIFUGAL PUMP

General Motors — Allison 200 GALLONS PER MINUTE

For Draining Basements • Fire Fighting Irrigation • Fuel Transfer Swimming Pools • Home Water Systems • Dewatering

For high volume commercial, home and industrial use. Standard 2 1/2" pipe thread inlet, twin 1 1/2" pipe thread outlets. Ball bearing supported 3/4" shaft. Easy priming. Rotation, counter-clockwise facing shaft. Gov't. acq. cost \$145.00. Complete with full instructions. Ship, wt. 35 lbs. F.O.B. Chicago. **39.50**

Will deliver 200 gals. per min. against 65 foot head using 5.2 H.P. at 3500 R.P.M.



EXTRA HEAVY DUTY Double Action HYDRAULIC CYLINDER

Item #224, 3 1/4" bore, 24" stroke, will lift 8250 lbs. with 1000 P.S.I. line pressure. 1 1/2" pipe thread ports—13 1/2" stress-proof ground, polished & plated solid steel shaft. Overall length closed 36". 1 1/2" steel wall cylinder barrel clevis mounting at base and shaft. Features — Tie Rod construction. Honed barrel. Ship, wt. 50 lbs. F.O.B. Chicago. **39.60**

TO PLACE PHONE ORDERS CALL WEBSTER 9-3793

ROSS 4-WAY FOOT OPERATED AIR VALVE

BRAND NEW—Item #60—For double-acting pneumatic devices. Fine for operating presses, air vises, air machinery of many types. Heavy duty cast construction. No neutral position. Maintains pressure against the piston when the foot control is in the "Up" position. Threaded for 1/2" pipe. Dimensions of valve body: 7 3/4" long x 4 1/4" width x 7 1/2" high. Net weight 28 lbs. A \$64.00 value for only **19.50** F.O.B. CHICAGO



NEW AIR FORCE SURPLUS — SHATTERPROOF AIR TANK

Item #303—Use for air compressors, surge tanks, CO-2 tanks, liquid containers, floats, buoys. 24" long —4" diameter—1 1/2" pipe thread port. Ship, Wt. 10 lbs. F.O.B. Chicago. **2.50**

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A tip for the 'Missus' who wants Christmas kisses



... the Hercules Plane



Both these SARGENT tools
will gladden the man in her life!

If *she* doesn't know what to give you . . . if she throws out hints about neckties and such . . . prop this page open where she will be sure to see it.

You know you need SARGENT GRIP-SNIPS*. You've seen them displayed at your hardware dealer's. You've admired their pleasant 'heft' in the hand, the narrow, parallel jaws, their powerful vise-like grip, their decisive wire-cutting action.

You also know how handy a SARGENT "Hercules" plane would be. Sturdy. Made the Sargent way, with Vanadium tool steel "Golden Cutter" blade, and strong, true iron frame and reinforced bed.

Ask your hardware dealer to show you SARGENT GRIP-SNIPS and a Hercules "Golden Cutter" Plane. Or write direct to Dept. 20L.

*TRADEMARK



**SARGENT &
COMPANY**

New York • NEW HAVEN, CONN. • Chicago

Builders Hardware and Fine Tools since 1864

Smoke-Eaters With Sea Legs

(Continued from page 142)

returned to the piers and doused them.

Ship fires pose tough problems for the fireboats. When all the monitors are spewing tons of water over the same side at once, the back pressure will send even the heavy *Fire Fighter* scooting sideways, away from the blaze she's trying to subdue. If you ever see a fireboat spraying water away from a fire, chances are she's holding her ground against back pressure.

One of the worst ship fires, the men think, was the *Black Gull*. "We met her off Montauk," says McKenna. "In some spots her hull plates were white hot. We had to use some monitors to hold position while we sprayed her for 2½ hours so she'd be cool enough to get lines aboard. Then we threw up hook ladders and climbed in. Naphthalene on her deck flared like explosives. We found four bodies aboard. Three were near the rear rail. They'd been racing to get over the side but never made it."

For sheer heroics, few wild tales can match the job the men did on the freighter *El Estero* during the war. Every available fireboat in the fleet was in on that fire. *El Estero* was loading ammunition at the Caven Point pier, close by the biggest ammunition dump on the East Coast, when fire broke out in her engine-room bilge. Flames raced up through hatches to the cargo hold and lapped against the ammunition storage bulkheads. When the boats

(Continued to page 268)

With pneumatic drills, firemen chip holes through concrete pier floors to get at blazing piling beneath
N. Y. Fire Department photo





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P-NCO OUTFIT

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Pays to have an assortment of CARBORUNDUM Brand Flint Papers in your tool kit or workshop. Five useful grades: Extra Fine, Fine, Medium, Coarse, Extra Coarse. Get my inexpensive "Handy Sandy" Assortment, and some full sheets, from your favorite hardware store or lumber dealer—today! And pick up a roll or two of FLEXBAC Masking Tape—another top-quality work-saver by CARBORUNDUM.

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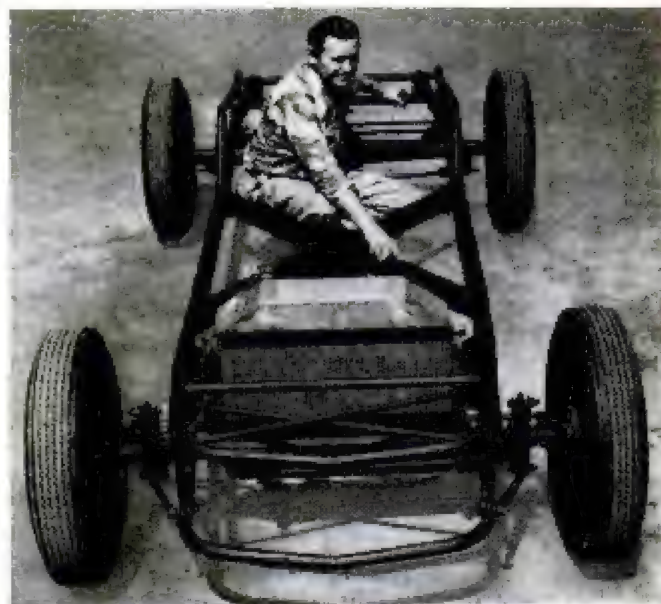
90-329

arrived, it was obvious that at any moment the ship would blow skyhigh—and with it would go everything in sight, including Caven Point.

In the face of this threat, fireboats started to tow her away from the pier. As she inched slowly from the stringpiece, gasoline drums on her deck began to explode. Gushing monitors were brought into play and sent the drums spinning across the deck and into the water, spreading liquid fire across the surface. It was a life-and-death race, for the monitors couldn't reach the fire that was warming up the big shells deep in the hold. "Every man aboard the *Fire Fighter*," says Jim McKenna, "figured it was his last day—and I guess the other crews felt the same. The suspense was terrific. She didn't go. They got her out into the river, aimed all monitors at her open hatches and with painful slowness she settled to the bottom of the river, sizzling and bubbling. But if it hadn't been for the Marine Division's grim determination, an epoch-making disaster would have been written in the history books that day. ★ ★ ★

Kurtis Offers Chassis For Build-a-Car Enthusiasts

Enthusiasts who prefer to assemble their own competition cars can now buy a 300-pound chassis patterned after the 1953 Indianapolis winner driven by Bill Vukovich. The chassis has a 100-inch wheelbase and is available with various assemblies including torsion-bar suspension, rear axle, steering gear, radiator and brakes. The 300-pound weight includes all these items plus running gear. The frame is of seamless steel tubing with an X-channel stiffening cross member. Adaptable to either a metal or plastic body, the chassis can be used for both competition and highway driving.





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City.....Zone.....State.....

If 8" combination Rip and Cross Cut Blade is desired enclose \$2.95 extra and check here ☐

Fortunes in Toy Ideas

(Continued from page 92)

ness. They had a small machine shop in a suburb of Cincinnati. For months they pored through trade journals in search of possible products—something that could be stamped, pressed and embossed in metal. These were the only operations their machines could perform.

One bleak morning in early December, 1945, Charles was sitting disconsolately in his office. Christmas was just around the corner, but he couldn't get in the spirit of the season. Then Fred walked into the office with a wooden toy truck under his arm. It was an old fire truck he'd received when he was six years old.

"Thought I'd fix it up and give it to the kids at Christmas," he said to Charley. The two of them started to repair the toy, replacing a missing wheel, straightening the axle and brightening it up with a new coat of paint. Fred remarked that he could probably make even better fire trucks out of metal. The spark of his idea blazed the two brothers into action.

"Why not?" said Charley. "We could make model toys that wouldn't fall apart under the most savage treatment." They decided to manufacture scale models of real construction and fire-engine equip-

ment. Despite the fact that they were making toys at a new high in selling price, from \$12 to \$20, their accurate, durable trucks and road-building equipment became a whooping success. Today 270,000 Doepke toy trucks and machines annually roll off the assembly line in their new manufacturing plant at Rossmoyne, Ohio. Manufacturers of real construction equipment are begging Doepke to make scale-model duplicates of their own brand-name trucks and machinery for two very good reasons: To promote good will among thousands of "tomorrow's" customers, and to be used as samples by their salesmen.

A few toys are invented by accident. One called "Slinky" actually walked right into someone's life. A 29-year-old engineer, Dick James, was employed by a Philadelphia shipyard in 1943. He was trying to mount delicate marine torsion meters so they would be both free of the savage roll of a ship in heavy seas and protected from the recoil of heavy gunfire. One idea was to suspend them on springs.

He tried hundreds of springs of different sizes and tensions, piled them on his desk when they didn't work. One day something jarred one coil loose and it commenced to strut down a pile of books like an animated accordion. As the top of the spring would

(Continued to page 272)

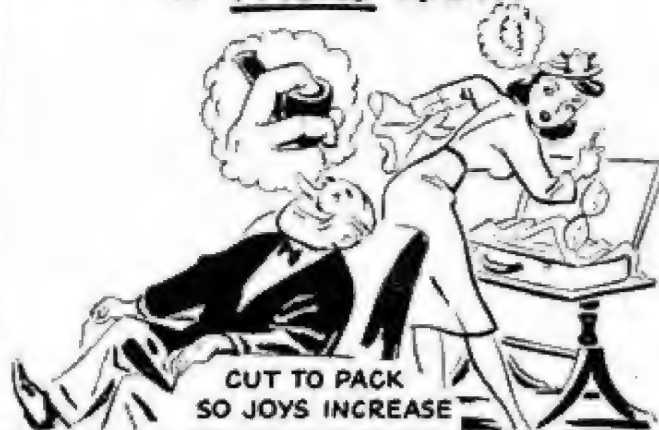
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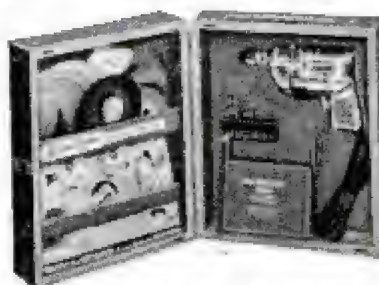
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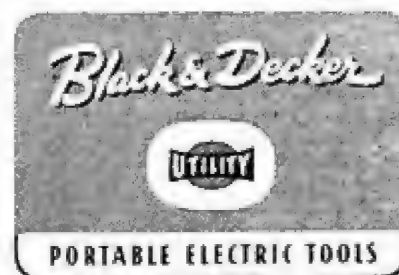


Includes: 1/4" All-Purpose Drill, 7 drill bits, 3 wood bits, countersink, sanding pad and discs, polishing bonnet, electric wax, and paint mixer, in fitted steel box that can be mounted easily on your workshop wall and quickly removed for carrying to the job. The perfect Christmas gift!



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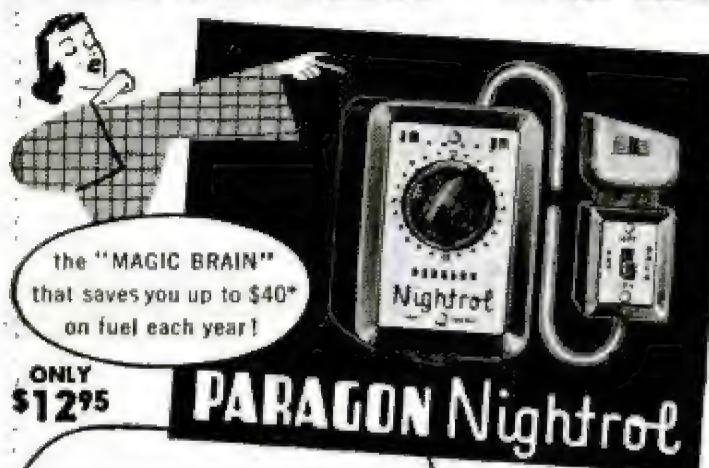
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reach a lower level, the bottom part would snap over its head like a tumbling acrobat and go down to the third level. James took the wire coil home for his children. The accidental plaything became a neighborhood craze. James began thinking seriously of marketing his toy but manufacturers told him he was crazy. "It's only an unpainted spring. You can't sell that as a toy." But James was too fascinated to give up. In the summer of 1945 he found a machine shop that would make the 2½-inch stack of 98 coils. He ordered all he could pay for. Then he went through four weeks of arguing with store buyers to give him counter space. Finally one relented, and with James demonstrating his slinky traveler, the store sold 450 within one hour and a record-breaking 20,000 before Christmas.

On James' desk in Clifton Heights, Pa., there's an annual pile of orders for more than 100,000 of these metal shavings. They come from all over the United States and from 20 foreign countries. After 10 years "Slinky" is still literally walking around the world.

Adult activities fascinate children, and more than one successful toy came from someone with an eye for simplifying something and putting it in a kit.

In 1912, A. C. Gilbert of New Haven, Conn., was an Olympic pole-vaulting champion three years out of Yale. One afternoon on his way to New York he watched workmen erecting steel towers and frames to support new power lines. He admired the way the girders could be used for so many different purposes. That night he designed some miniature girders out of cardboard and started building his own railroad, electric towers and bridges. But the cardboard wasn't durable enough, so Gilbert decided to make them out of steel. He got a local New Haven toolmaker to help. For some time he kept his hobby set to himself. When his company, the Mysto Manufacturing Company, needed another product besides magic sets to bolster lagging sales, Gilbert decided to give his steel girder construction set a fling as a toy. His toy is the world famous Erector set and three years after its birth it had netted Gilbert \$300,000. Today he is a millionaire.

In practically all the above examples of toy inventing, there is one underlying theme. The toys were imitations of something in adult life. There are thousands of dollars of unwanted "space" toys and nuclear-fission chemistry sets lying under counters today because some inventors were more "out of this world" than the toys. Fission to a child is something that should be done with a rod and reel. So, keep your idea simple, and good luck. ★ ★ ★

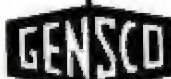
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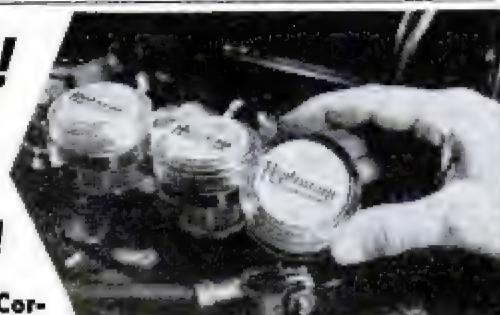
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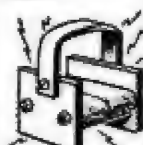
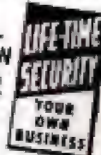
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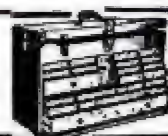
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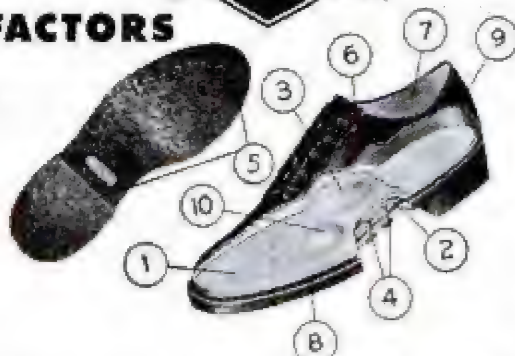
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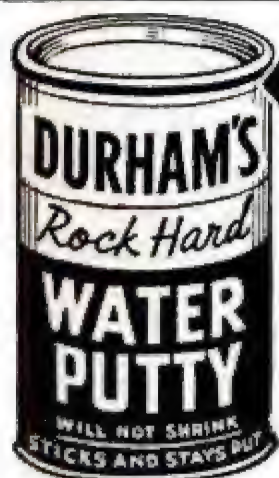
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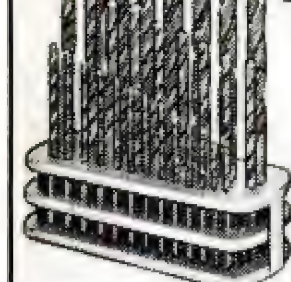
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(Drills from $\frac{1}{16}$ " to $\frac{1}{2}$ " by 64ths)



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INSTANTLY REMOVES

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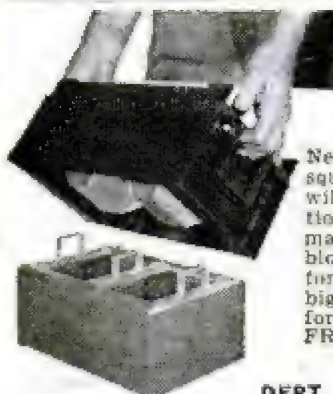
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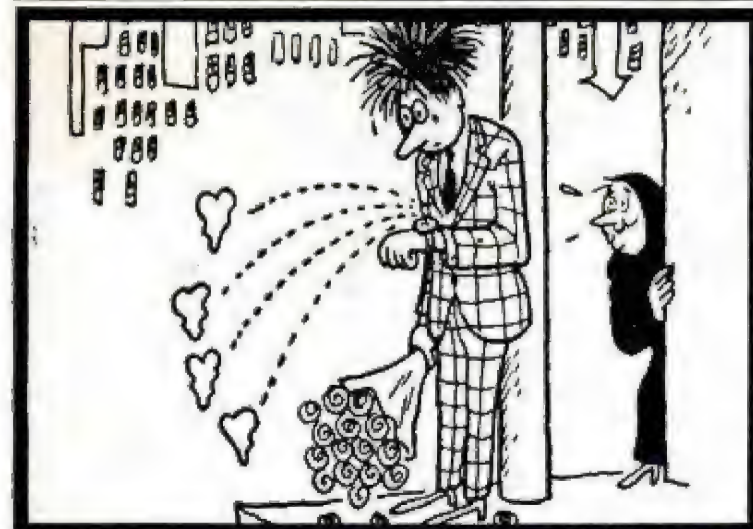


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World's Largest Plywood Organization

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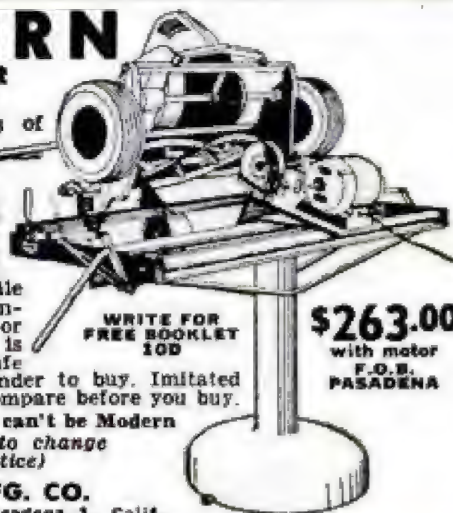
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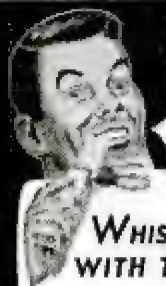
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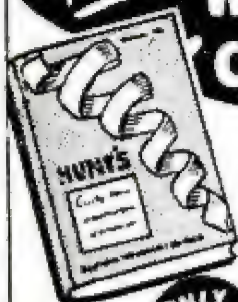
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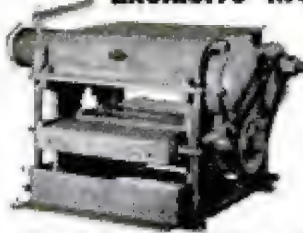
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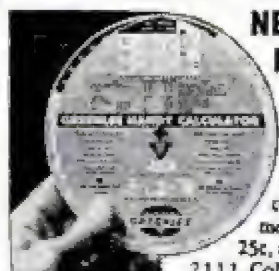
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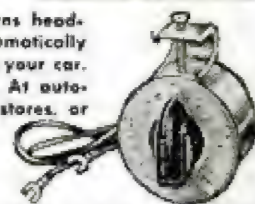
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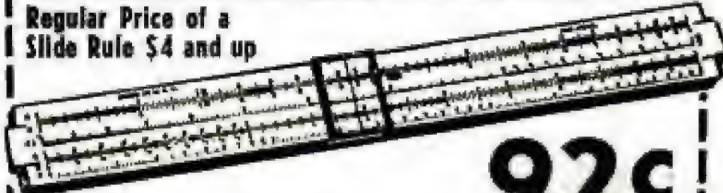


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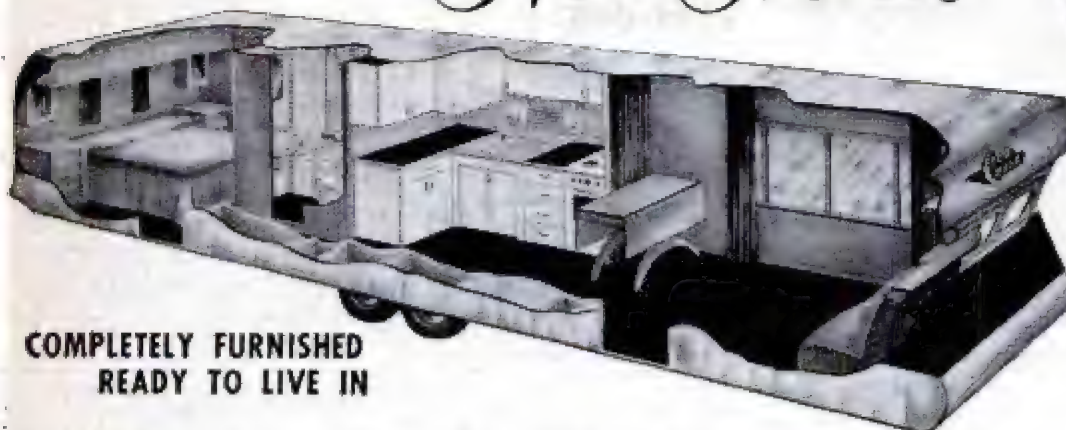
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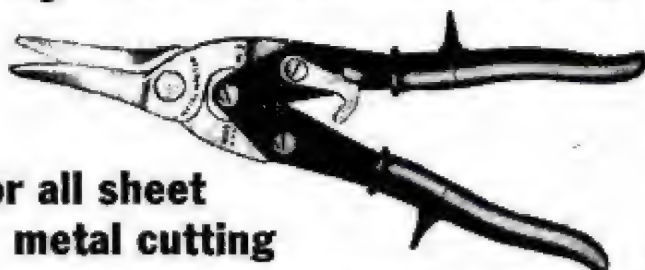


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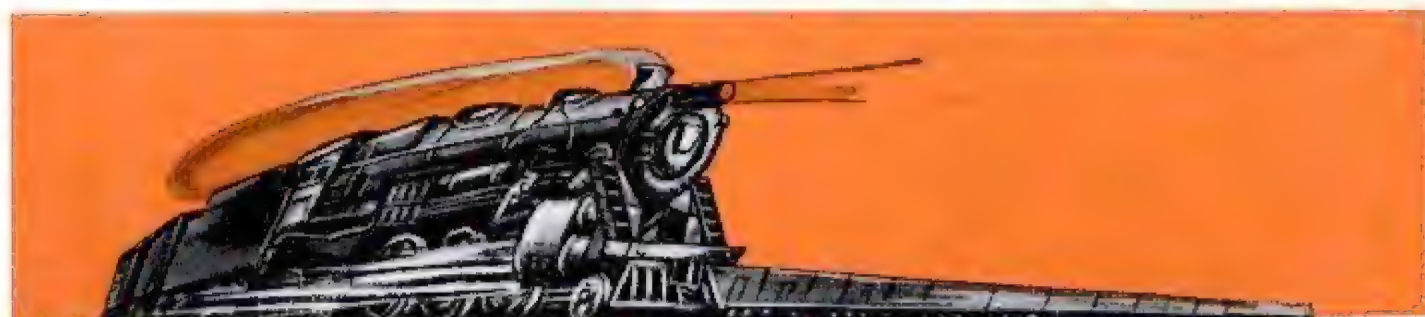
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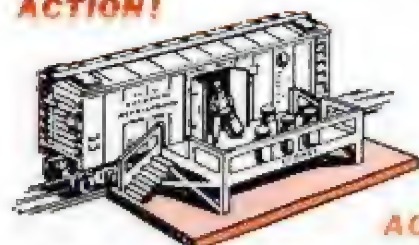
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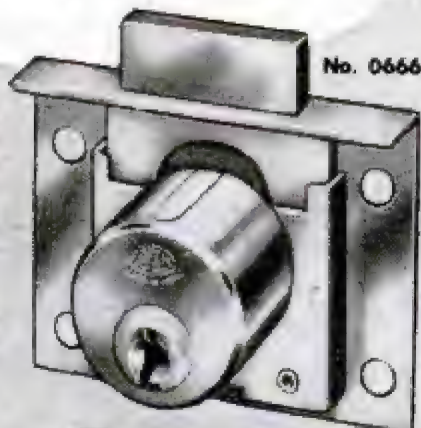
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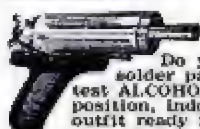
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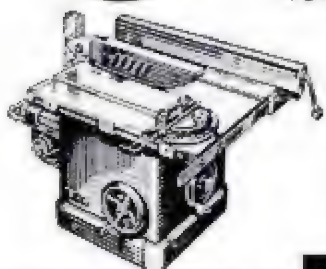
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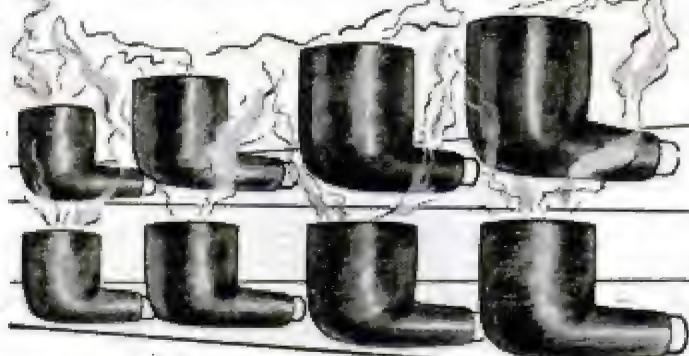


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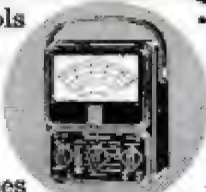
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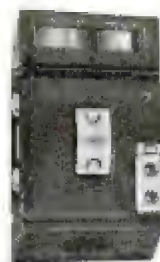
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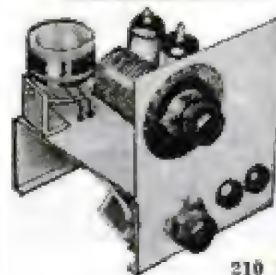
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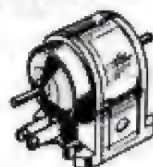
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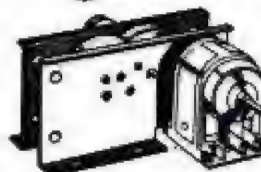
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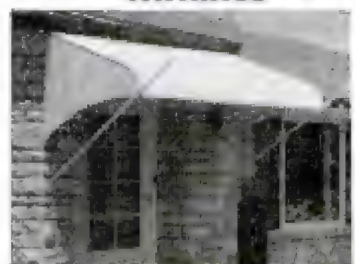
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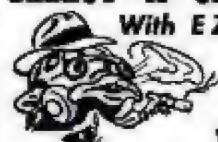
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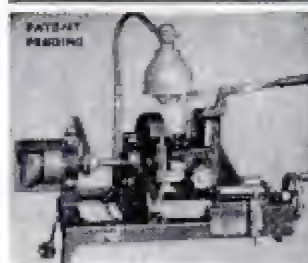
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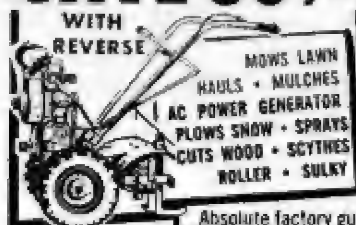
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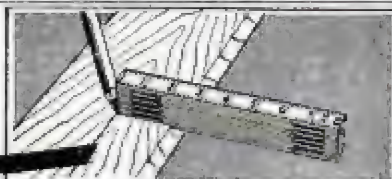
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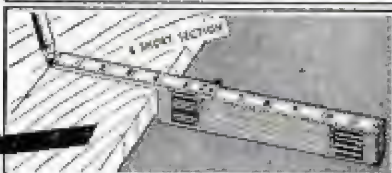
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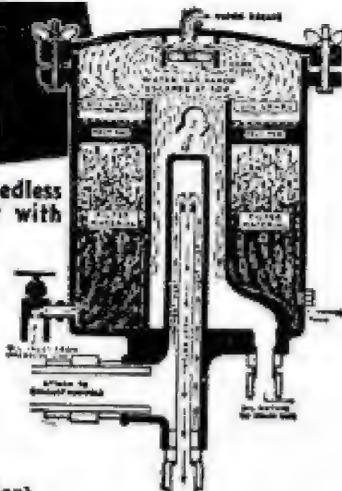
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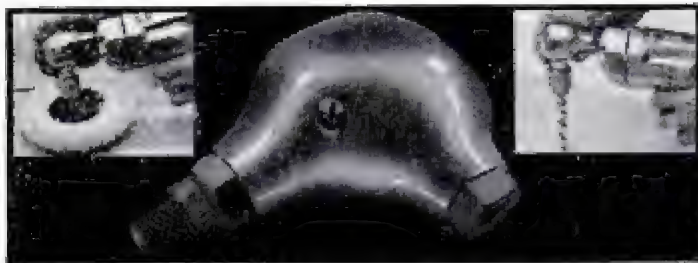
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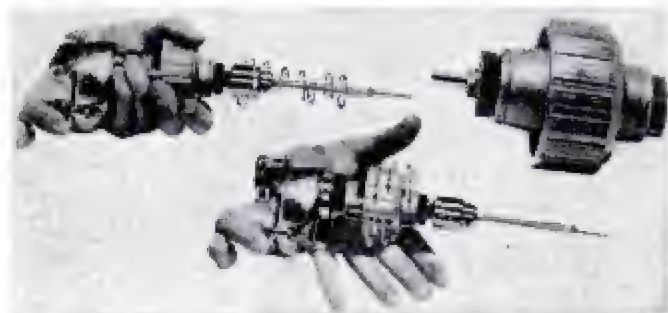
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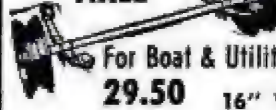
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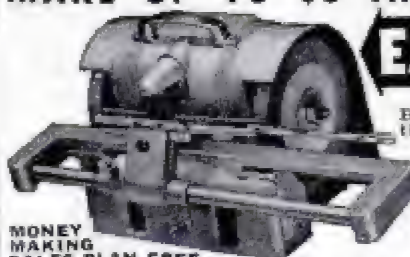


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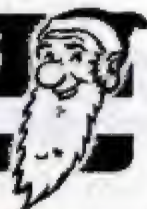


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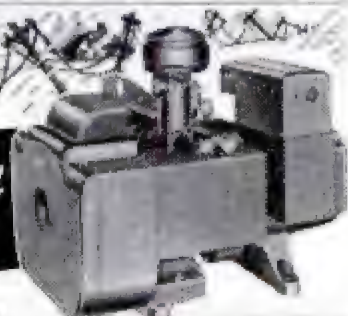
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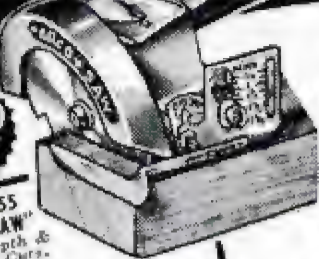
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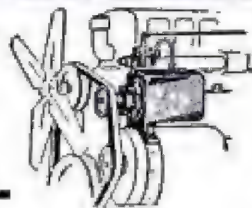


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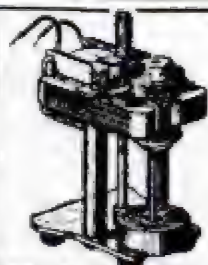
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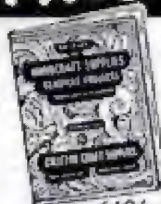
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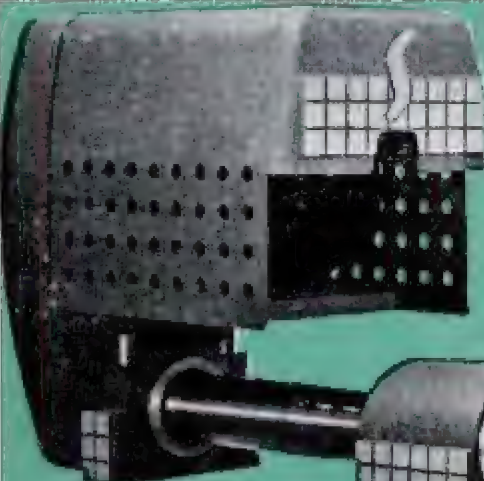
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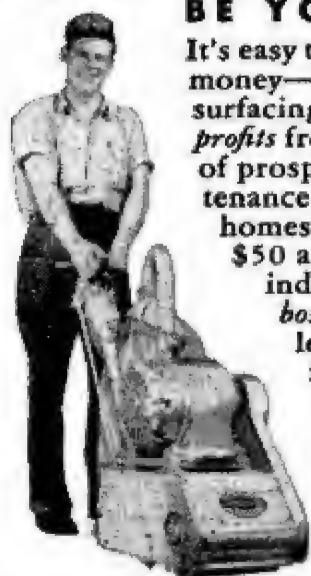


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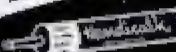


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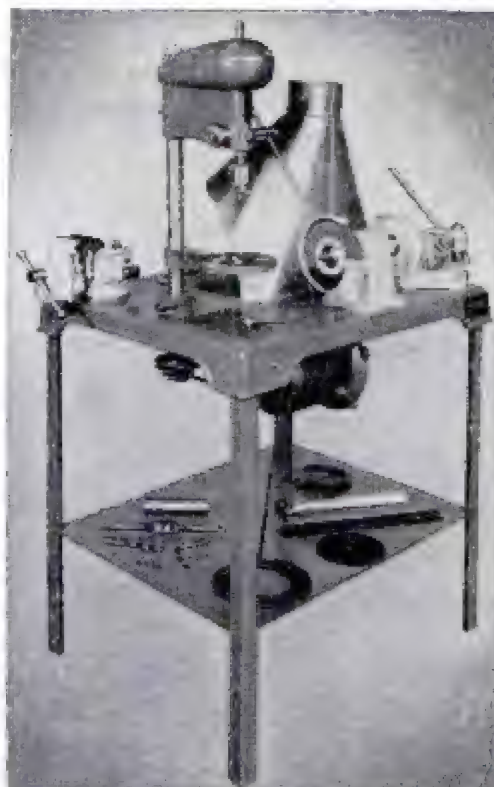
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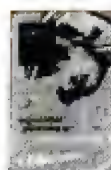
THESE PENTA-TREATED STEPS WILL LAST YEARS LONGER!



PENTA, the clean wood preservative, makes the wood you use last years longer . . . protects against both termites and decay

SEND FOR THIS FREE BOOKLET

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Dept. PE 3-682
Midland, Michigan



Please send me without cost:

— "Handyman's Guide to Home Wood Preservation."

— Location of my nearest PENTA dealer.

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You can make wood last years longer by protecting it against termites and decay with a wood preservative containing PENTA*. Simply flood it on the wood with a broad brush. Water-repellent solutions containing PENTA also improve dimensional stability and reduce checking caused by moisture and hot sun. The wood you treat with this type of PENTA solution is clean and paintable, too.

Write for Dow's new booklet, *Handyman's Guide to Home Wood Preservation*. It tells how to apply PENTA solutions to porches, storm windows, fencing, picnic tables and other projects you plan for your home.

Your lumber dealer or paint store stocks name brand wood preservatives in both paintable grades and those to be left natural. Look for the name *PENTACHLOROPHENOL on the label. THE DOW CHEMICAL COMPANY, Midland, Michigan.

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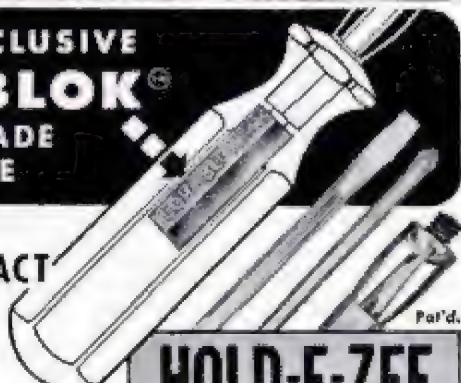
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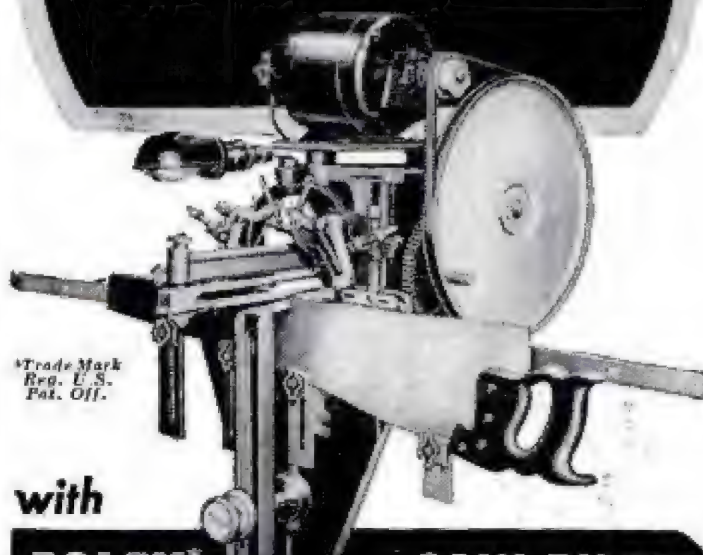
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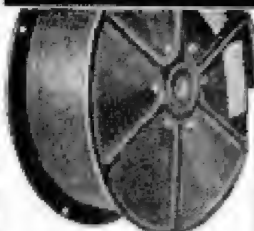
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TWISTED TWO CONDUCTOR \$5.00
No. 18 STRANDED per 1000 ft.
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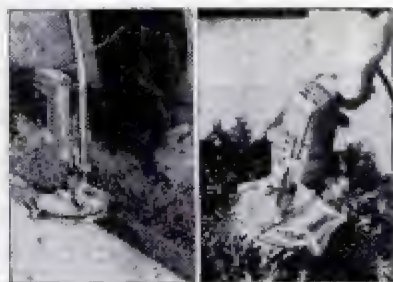
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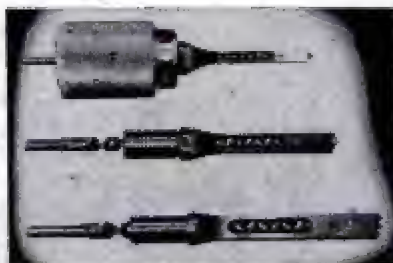
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Includes $2\frac{1}{2}$ " grindstone, 3" wire brush, 4" cloth buffing wheel and "drive shaft" that chucks into your drill. Use it on metals, to polish, buff, grind, scrape, sharpen, remove rust, paint, scale, etc. Complete, only.. **295**

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HACKSAW-SANDER KIT

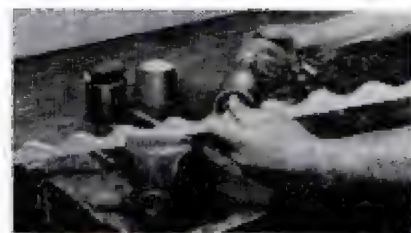
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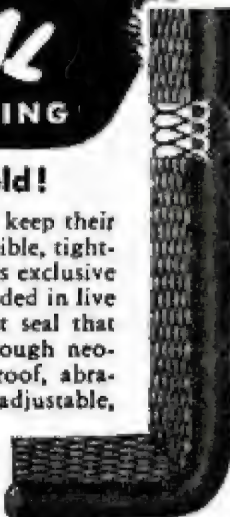
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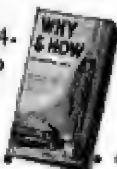
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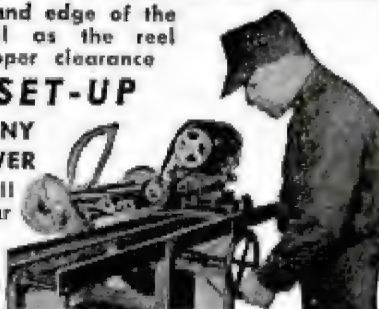
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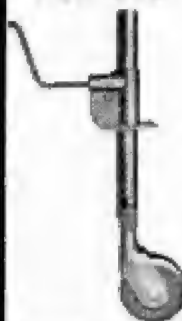
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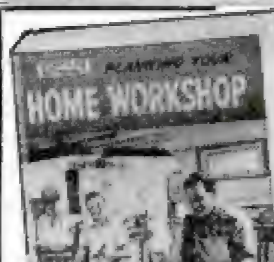
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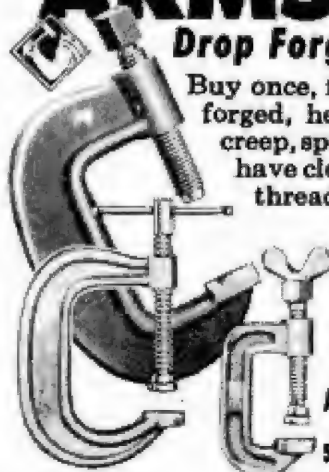
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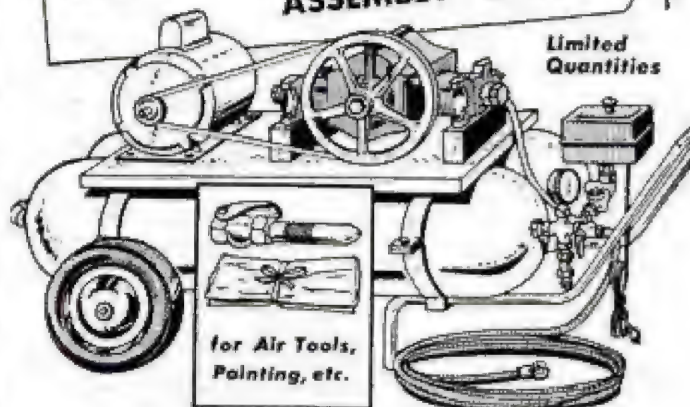
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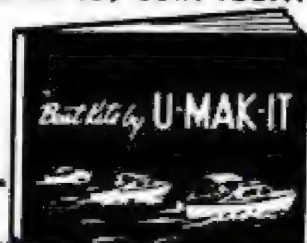
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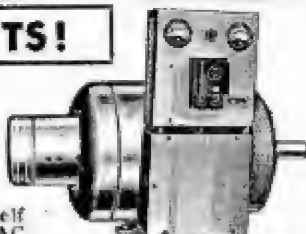
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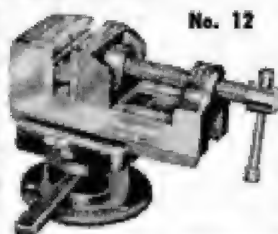
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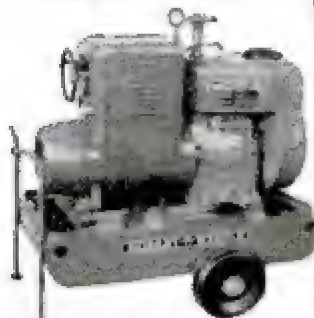
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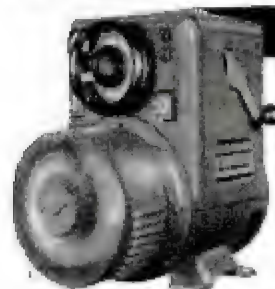


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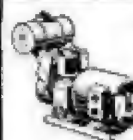
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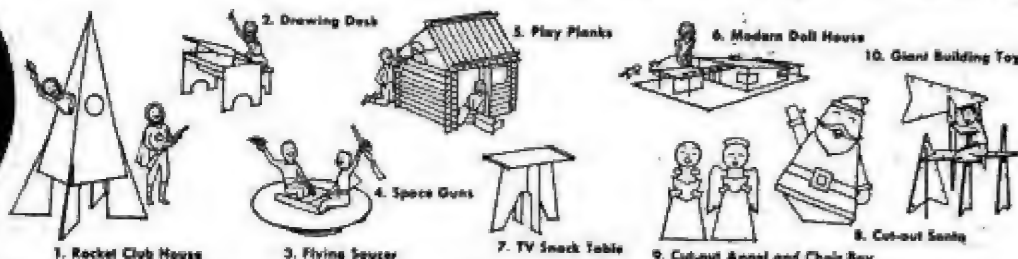
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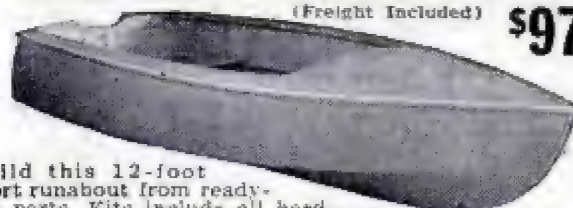
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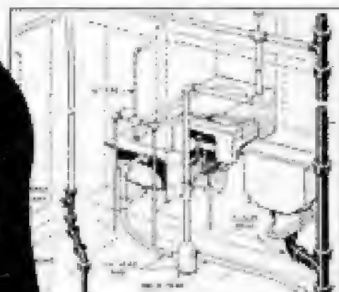
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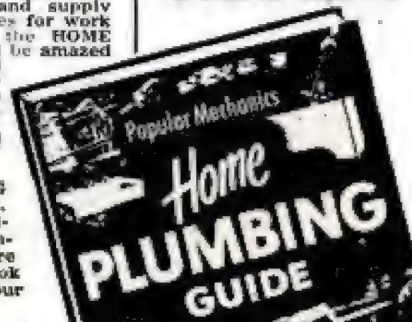
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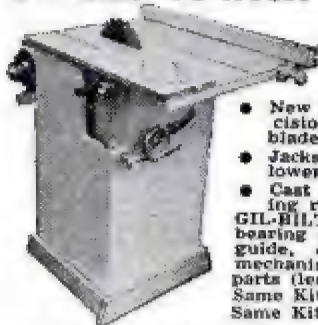
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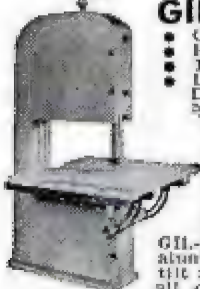


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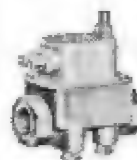
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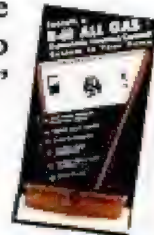


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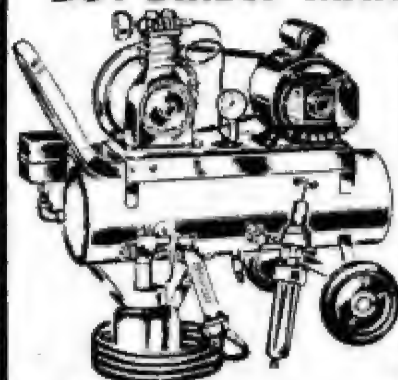
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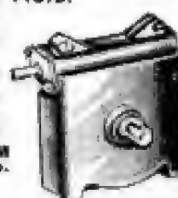
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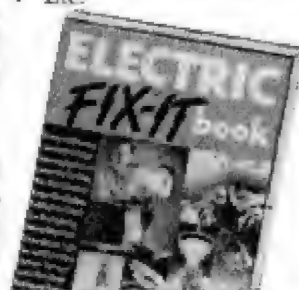
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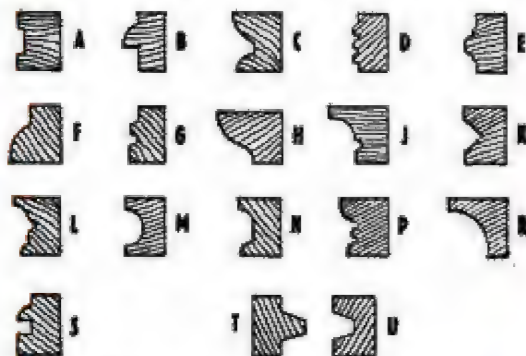


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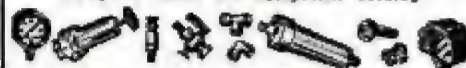
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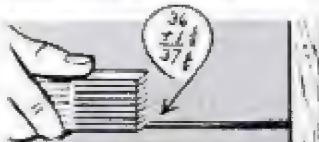
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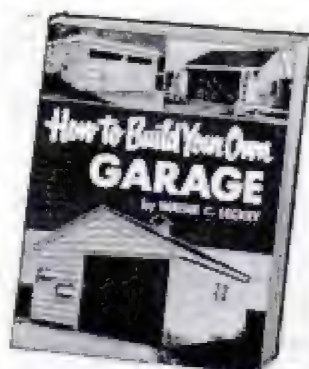
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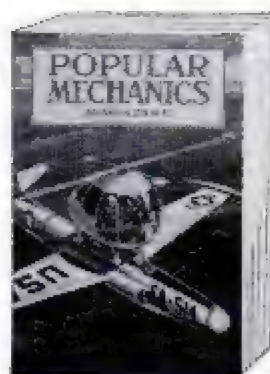
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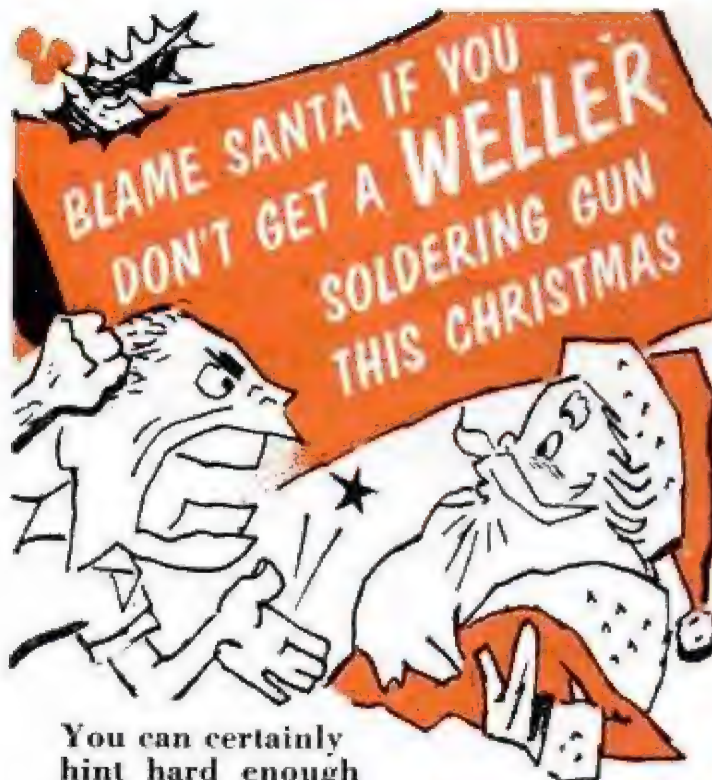
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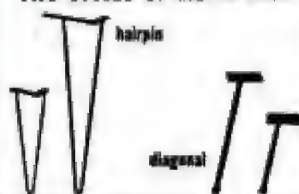


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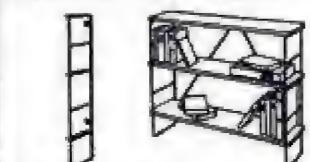
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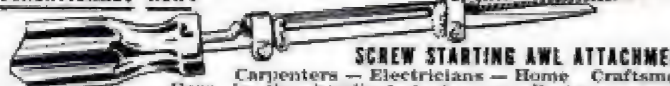


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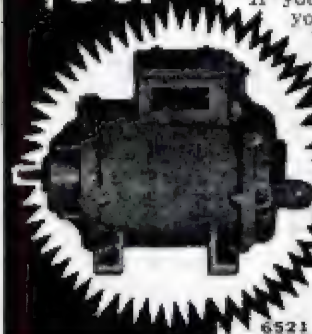
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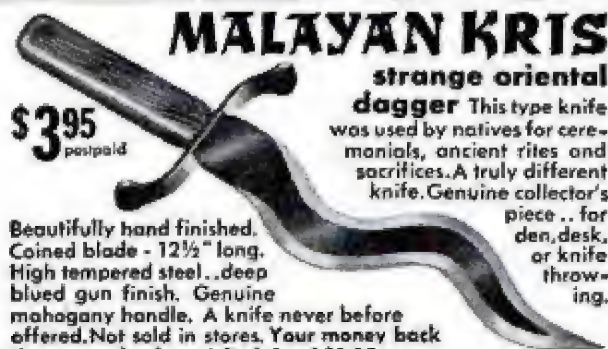


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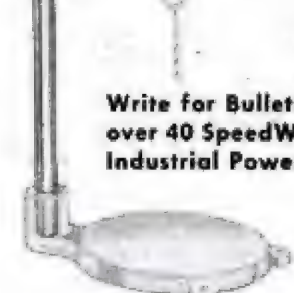
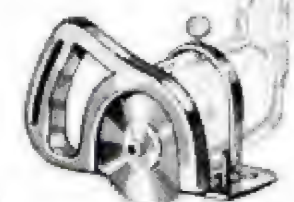
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Highest tungsten content, sharp and ready to go. Used drills have at least 70% of original flute length. 20 sizes, 1/4" to 1". \$70 value.



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High speed steel. Sizes 1/4" to 1-3/16".
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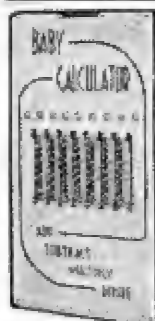


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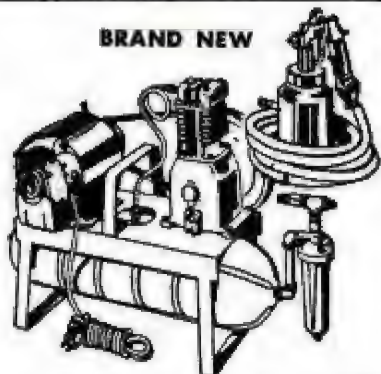
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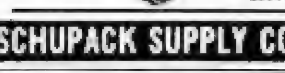
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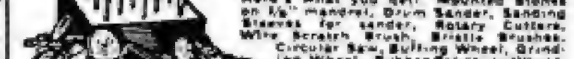
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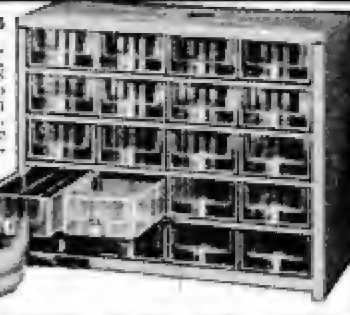
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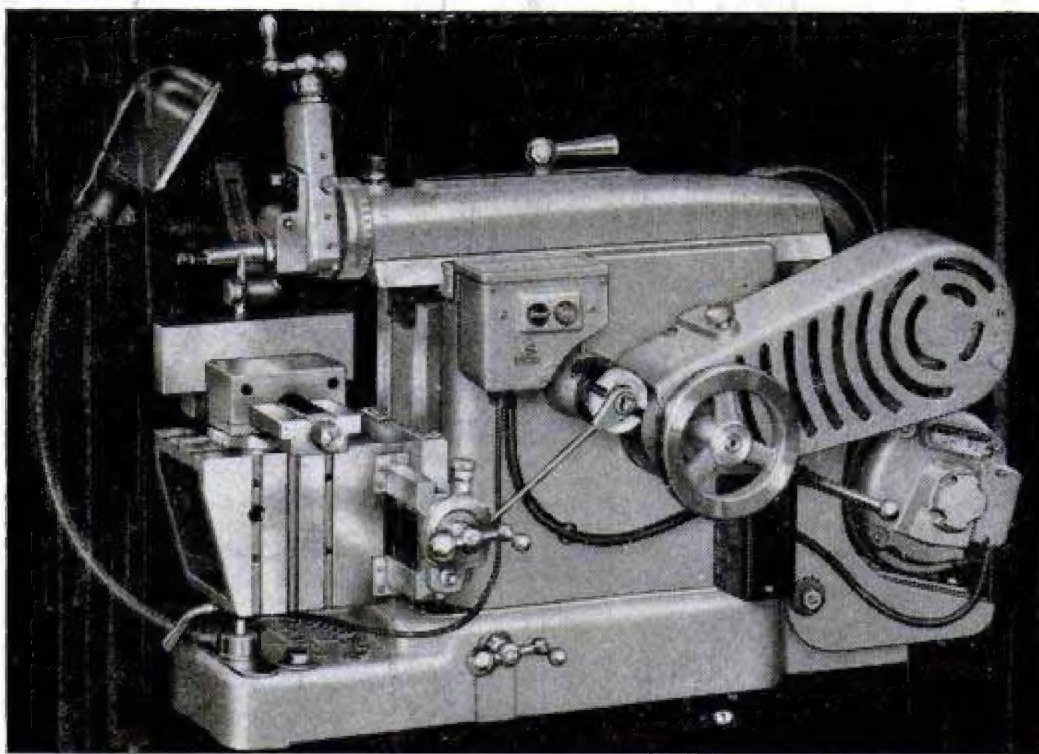
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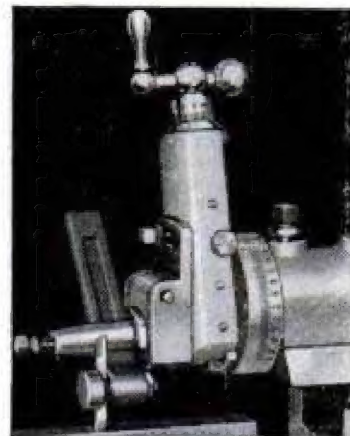
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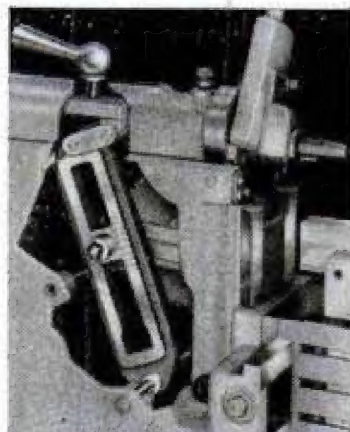
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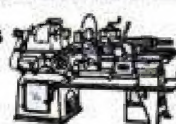
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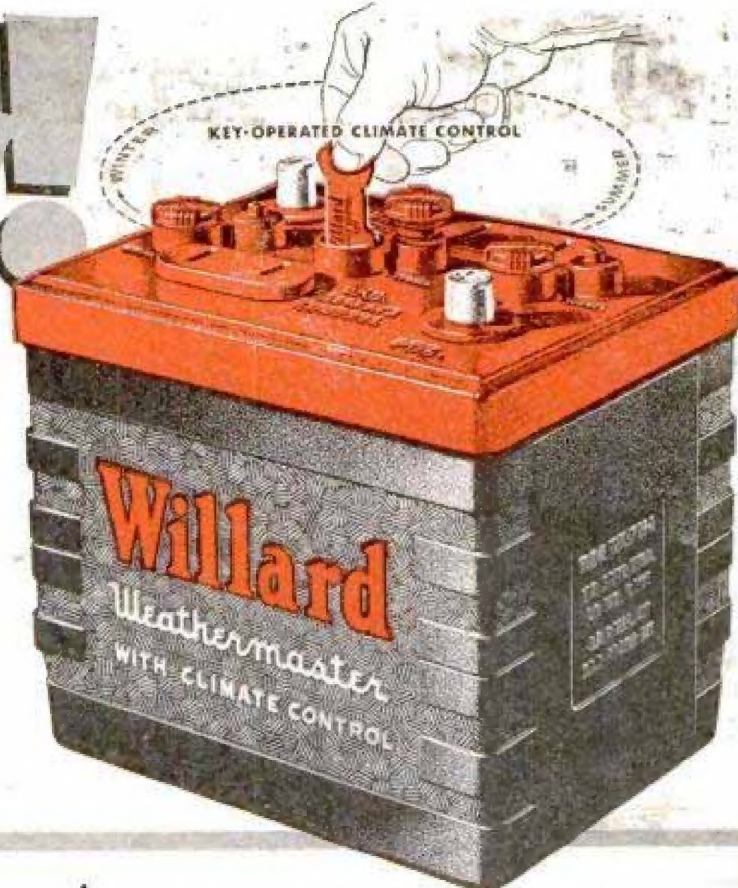
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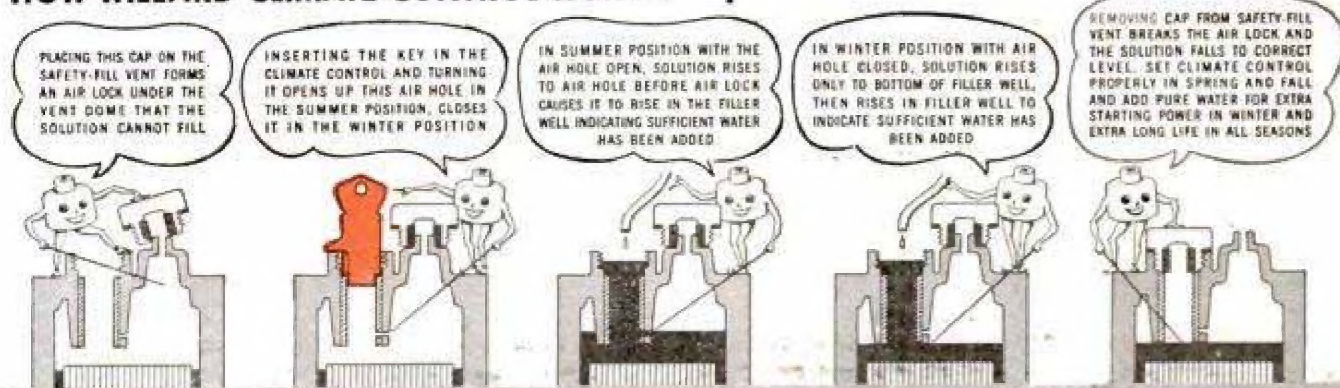
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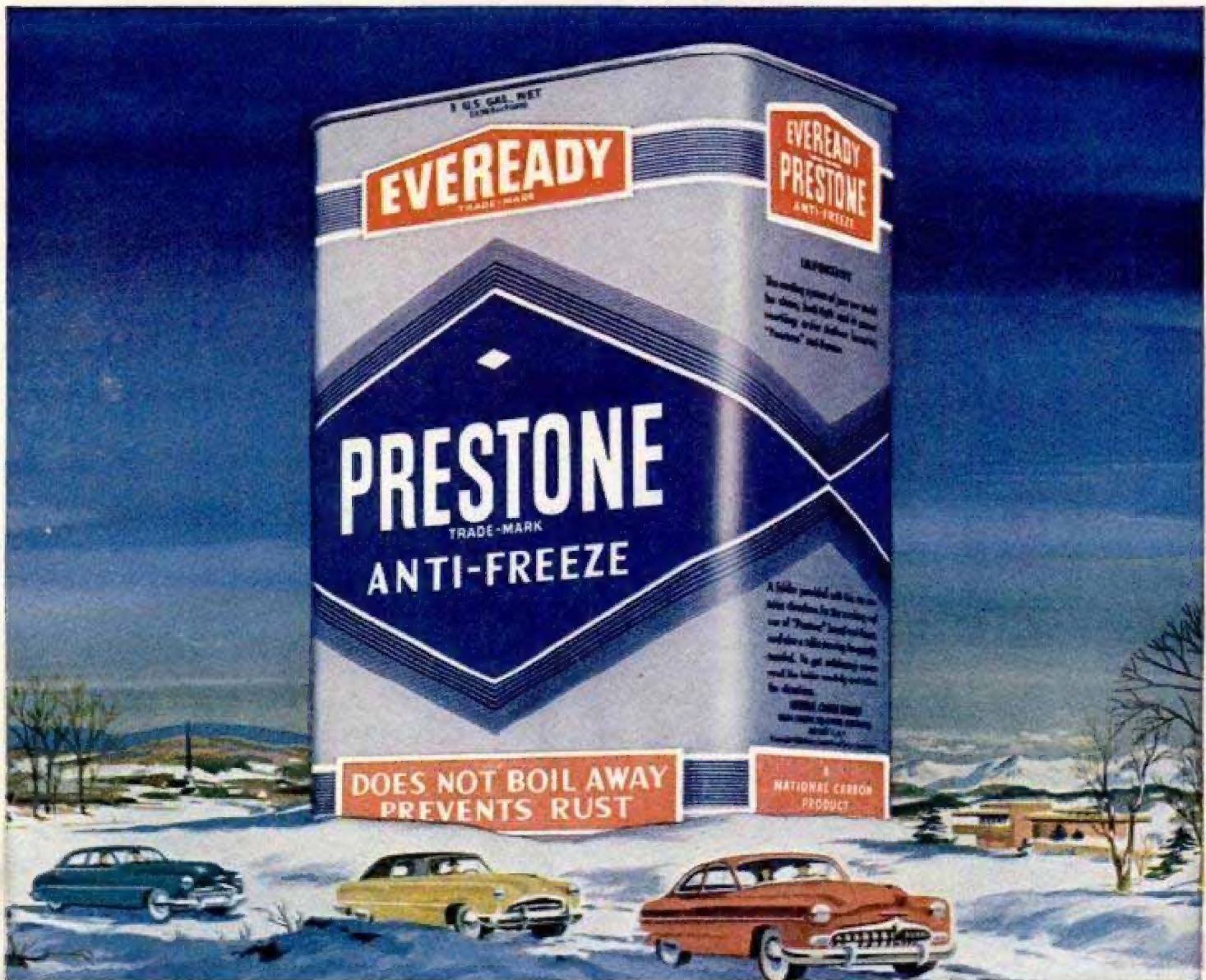
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